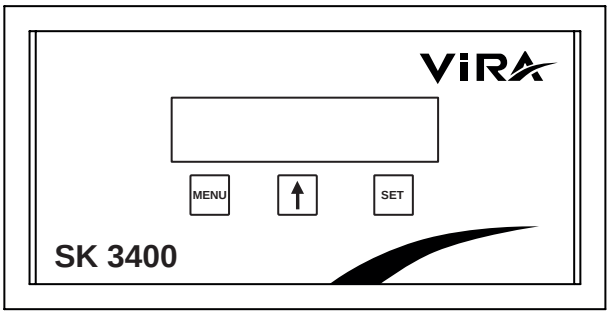
SK 3400
Modulating Level System Controller

Installation, Operating and Maintenance Instructions



Local regulations may restrict the use of this product under certain conditions.
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 commission 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 3400 level probe, is type approved by TUV. The TUV "EN 12952 and EN 12953 " describes the requirements for water level control and limiting equipment.

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

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

ATEX (Atmosphere Explosive Atmospheres)

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

2. General Information

The SK 3400 is an electronic modulating level controller designed for precise, continuous boiler feedwater regulation. Used together with the SD 3400 capacitance level probe and the SKV 3400 proportional control valve, the SK 3400 forms an integrated system that continuously monitors water level and adjusts feedwater flow accordingly.

In addition to proportional (modulating) control, the SK 3400 also offers on-off level control capability and provides configurable high and low level alarms, ensuring enhanced safety and flexibility for various boiler applications.

2.2 Function

As steam is generated in the boiler, the water level gradually decreases due to evaporation. To maintain safe and efficient boiler operation, this lost water must be replenished continuously through a feedwater control system. Keeping the water level within the ideal range is critical-not only to prevent damage to the boiler and its components, but also to ensure optimal steam quality and thermal efficiency.

The SK 3400 proportional level controller continuously monitors the water level using a capacitive probe and provides precise control of the feedwater valve through proportional output signals. Instead of simply turning the feedwater valve fully on or off like traditional systems, it modulates the valve position proportionally to the deviation from the setpoint. This ensures smooth and accurate water level regulation, reduces mechanical stress, and minimizes pressure fluctuations, contributing to longer equipment lifespan and more stable boiler performance.

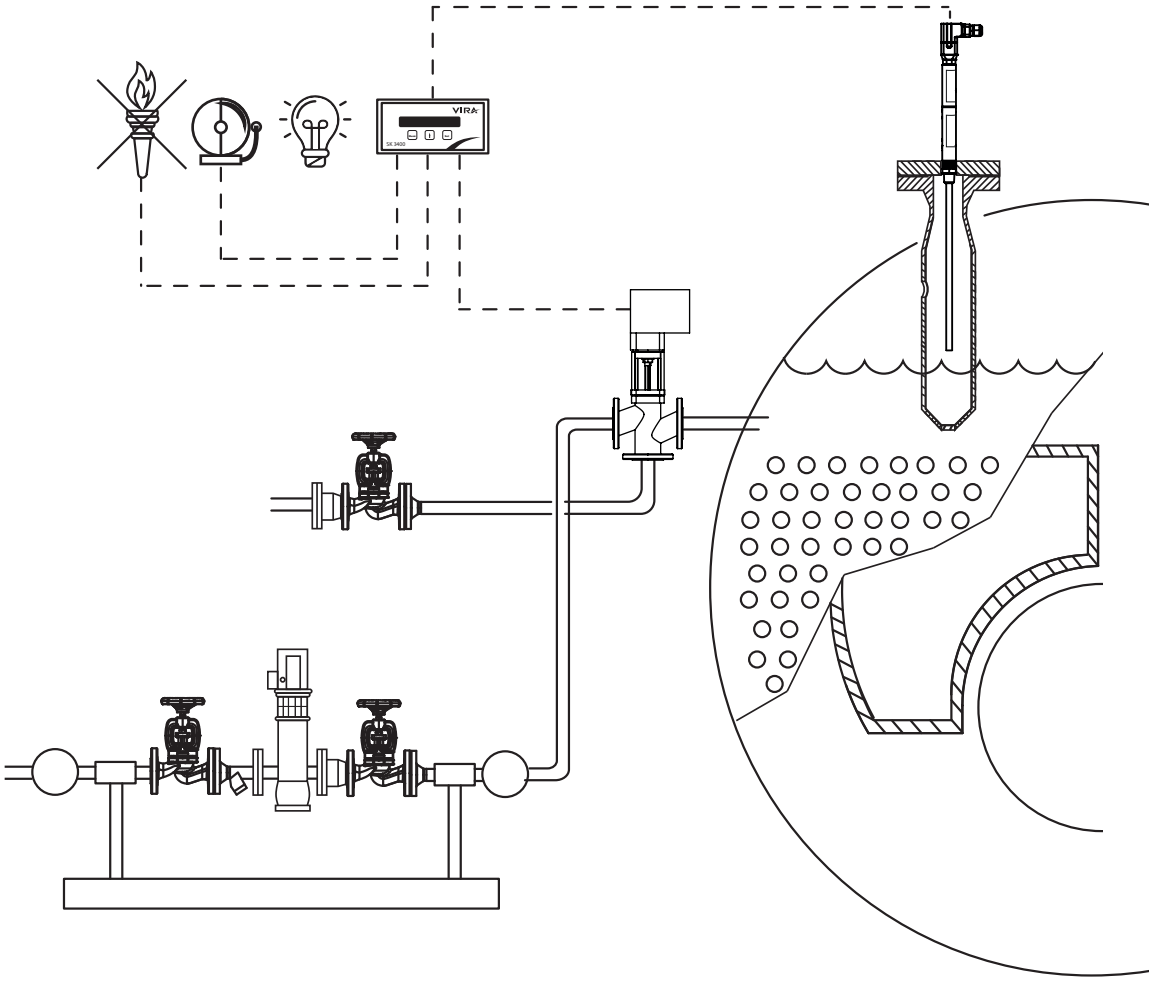


Figure 1 : SK 3000 System Application

The SK 3400 proportional level controller is designed to operate in a modulating (proportional) level control system. It continuously monitors the water level in the boiler and provides a precise analog control output to modulate a feedwater control valve accordingly.

The control point for maintaining the water level is determined by the length of the capacitive probe SD 3400 level sensor. The system detects whether the water level is rising or falling and calculates the proportional deviation from the setpoint.

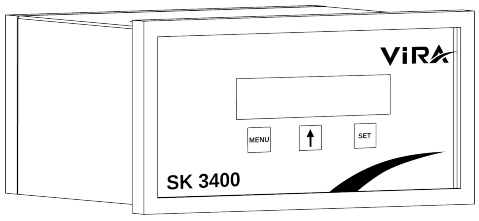


Figure 2 : Perspective View of SK 3400

Based on this deviation, the controller provides continuous level information via its 4–20 mA signal output for monitoring purposes, while the actual modulation of the feedwater valve is achieved through three-step control signals. The valve position is adjusted proportionally using feedback from the valve's 0–1 kΩ position potentiometer, ensuring dynamic flow control and maintaining water level within the optimal operating range. This approach enables more stable boiler operation, reduces mechanical wear, and improves steam quality compared to traditional on-off

Typical Applications

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

2.3 Modulating Level Control – Water Level Definitions

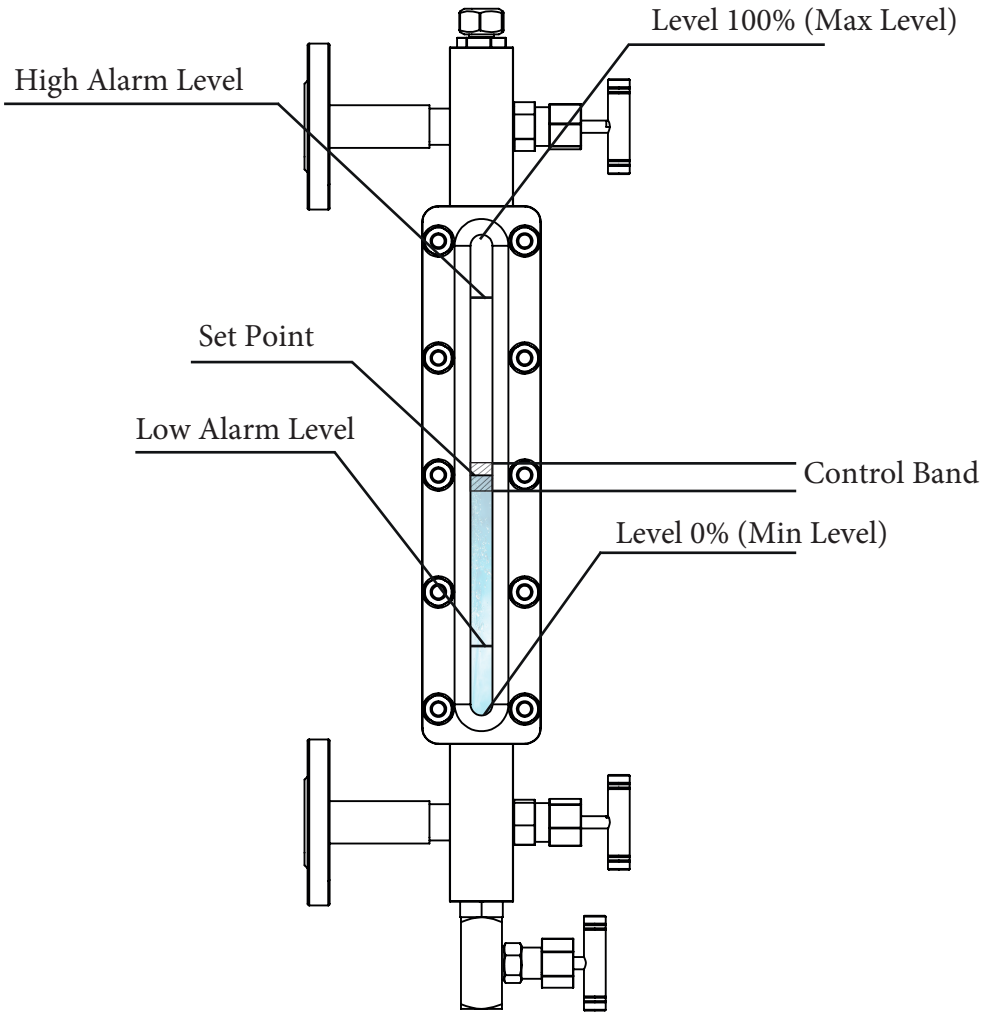


Figure 3 : Example Water Level Settings in Modulating Level Control System

Typical layout showing 0%, 100%, Set Point, Control Band, and Alarm Levels.

Label	Description
Level 0%	Lowest level detected by the probe (Min Level)
Level 100%	Highest level detected by the probe (Max Level)
Set Point	Reference water level to maintain
Control Band	Acceptable range for level variation
Low Alarm	Level triggering the low-level alarm
High Alarm	Level triggering the high-level alarm

Table 1 : Water Level Definitions

Note: The exact set point and alarm levels are configurable based on boiler design and operational requirements.

3. Mechanical Installation

3.1 Dimensions

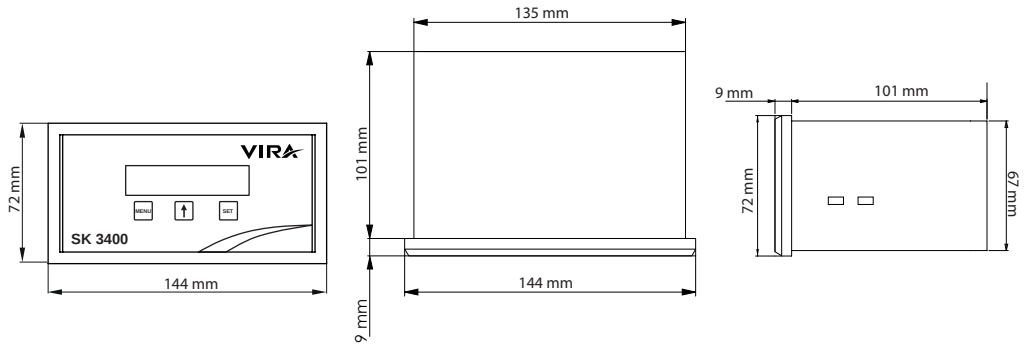


Figure 4 : SK 3400 Modulating Level Controller Enclosure Dimensions

3.2 Panel Mounting of Enclosure

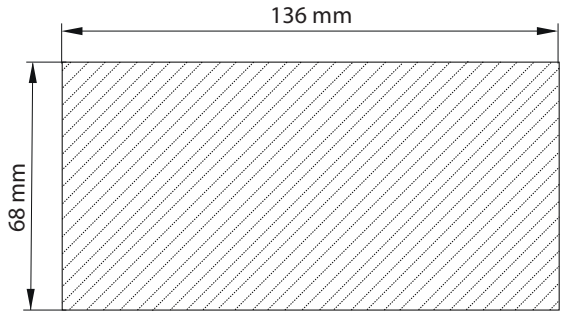


Figure 5 : Panel Cut Out Dimensions of SK 3400 Modulating Level Controller

3.3 Name Plate

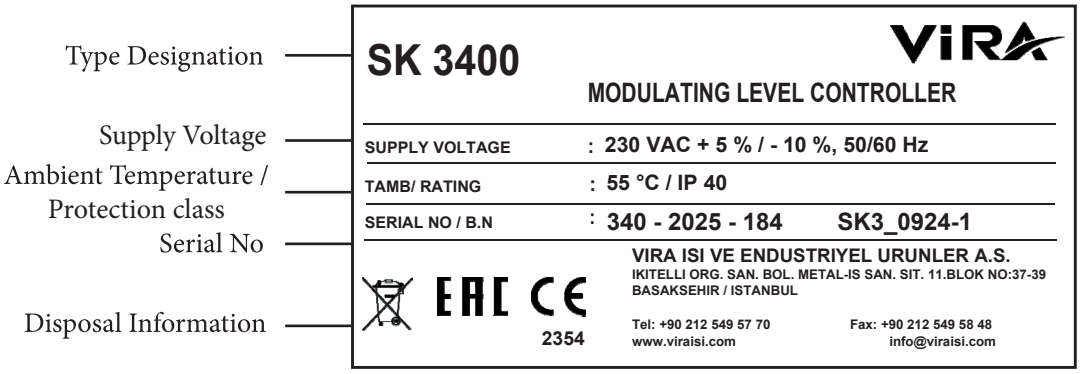


Figure 6 : SK 3400 Name Plate

4. Electrical Installation

4.1 Wiring Diagram

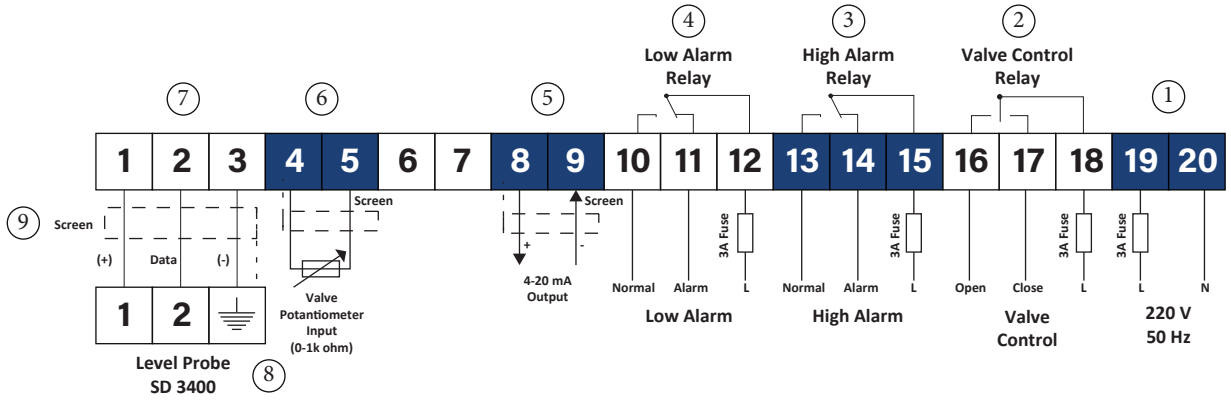


Figure 7 : SK 3400 Modulating Level Controller Wiring Diagram

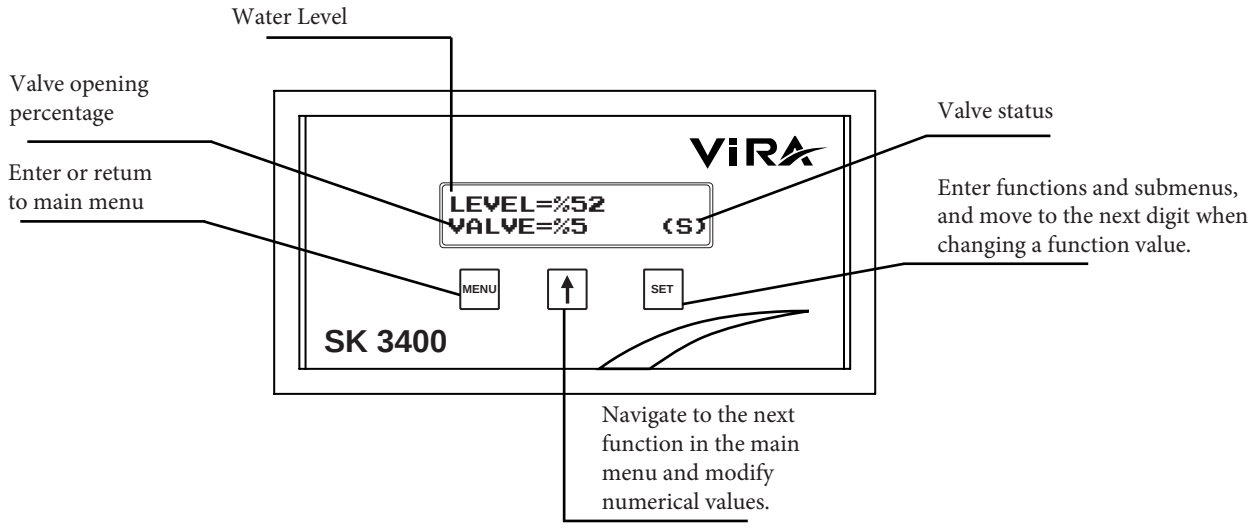
Item	Description
1	Supply voltage connection 220VAC with semi-delay fuse M 3A provided on site.
2	Output contact for valve modulation.
3	High Alarm output contact.
4	Low Alarm output contact.
5	4–20 mA analog output.
6	0–1 kΩ feedback signal connection.
7	SD 3400 Capacitance level probe input.
8	Functional earth in the SD 3400 Probe body (tank), with cable shield connection.
9	Cable shield, wired only in probe side.

Table 2 : 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 Valve Actuator, please refer to "SKV 3400 Level Control Valve Installation and Operating Instructions".

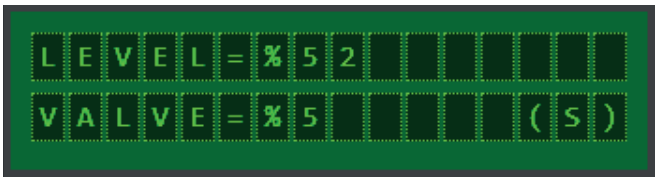
5. FUNCTIONS and CONFIGURATION



MENU This button is used to access the main menu or to return to the main menu from a submenu.

This button is used to navigate to the next function in the main menu and to modify numerical values.

SET This button is used to enter functions and submenus, and to move to the next digit when editing a function's value.



The screen shown above is the main display of the SK 3400. The upper row indicates the water level while the lower row displays the valve opening percentage.

(S) The valve remains steady at its current position with no active movement.

(+) The valve is in the process of opening.

(-) The valve is in the process of closing.

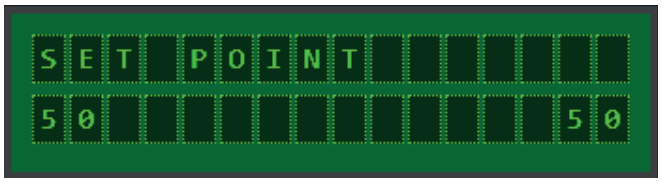


Figure 8: Example Screen Image of a Function Menu

To access the main menu, press and hold MENU button for 3 seconds.

While in the main menu, ↑ button is used to scroll through the available functions.

To enter a selected function, press SET button.

Within a function:

Use ↑ button to change the value of the current digit.

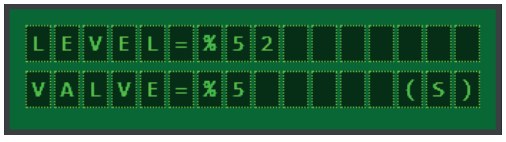
Use SET button to move to the next digit.

After modifying the final digit, press SET button again to save the new value.

To exit the function and return to the main menu without saving any changes, press MENU button.

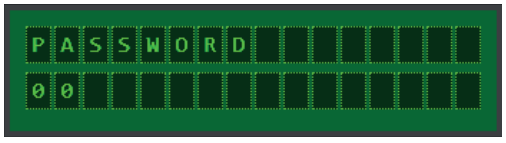
5.2 Changing Functions and Configurations

5.2.1. Startup Screen



When the device is powered on, the screen appears as shown in the figure on the left. To enter the main menu, press and hold MENU button for 3 seconds.

5.2.2. Password



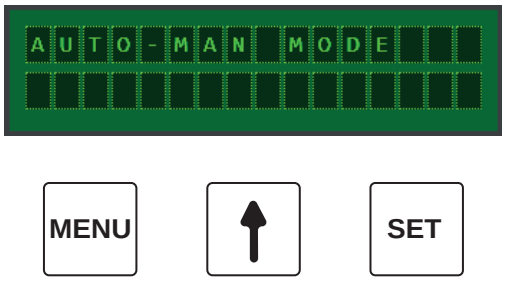
To prevent unauthorized access, the SK 3400 is equipped with password protection.

Use ↑ button to change each digit and SET button to move to the next digit.

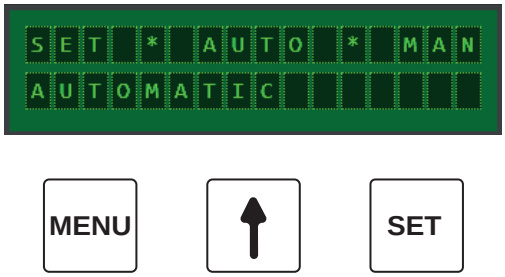
After modifying the last digit, pressing SET button confirms the password.

If the entered password is correct, the device automatically enters the main menu.

5.2.3. Auto-Man Mode



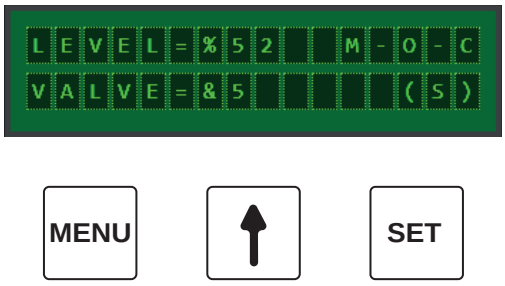
This function is used to set the operating mode of the SK 3400. The device offers two operating modes: Automatic and Manual. In Automatic mode, the valve is fully controlled by the SK 3400 according to the system parameters and process conditions. In Manual mode, the user can directly control the valve using the interface of the SK 3400. To enter the function menu and change the operating mode, press SET button.



MENU Saves the changes and returns to the main menu.

Automatic operating mode. In this mode, the valve is controlled automatically by the SK 3400 according to the system conditions.

SET Manual operating mode. In this mode, the valve is controlled manually by the user through the SK 3400 interface.



When manual mode is active, the main screen appears as shown in the figure on the left. The valve can be controlled manually using and SET buttons.

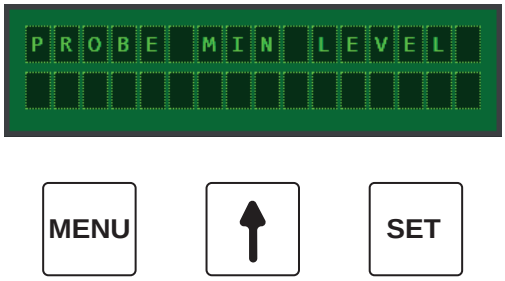
MENU Access the main menu.

Opens the valve.

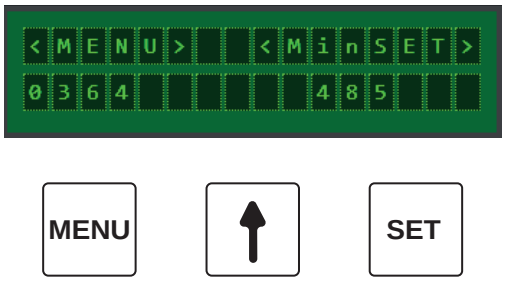
SET Closes the valve.

During valve opening, the symbol “+” is displayed in parentheses. During valve closing, the symbol “–” is displayed.

5.2.4. Probe Min Level



This function is used to set the lowest water level (defined as 0%) that should be detected by the probe. Press SET button to enter the function menu.

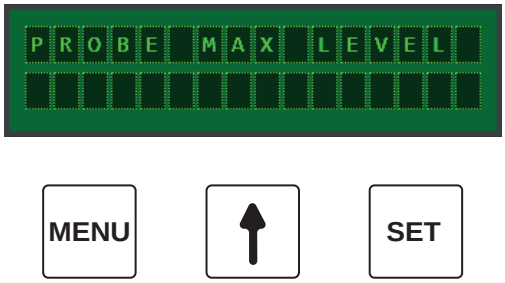


On this screen, the number on the right displays the previously set PROBE MIN LEVEL value, while the number on the left shows the current water level.

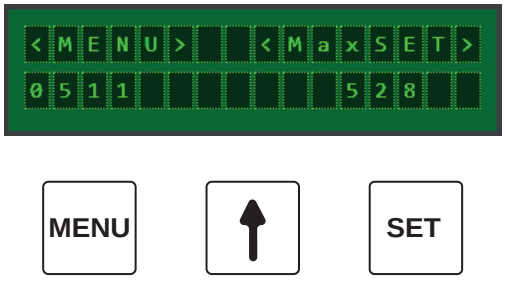
To set a new probe minimum level, press SET button when the desired water level is reached.

To return to the main menu without saving the new value, press MENU button.

5.2.5. Probe Max Level



This function is used to set the highest water level (defined as 100%) that should be detected by the probe. Press SET button to enter the function menu.

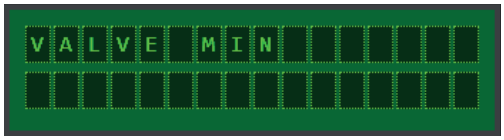


On this screen, the number on the right displays the previously set PROBE MAX LEVEL value, while the number on the left shows the current water level.

To set a new probe maximum level, press SET button when the desired water level is reached.

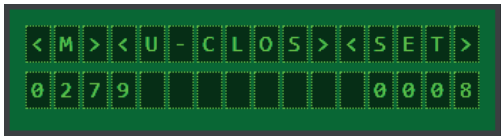
To return to the main menu without saving the new value, press MENU button.

5.2.6. Valve Min



This function is used to set the fully closed valve position.

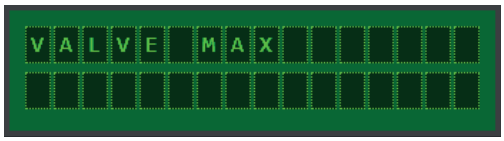
Press SET button to enter the function menu.



On this screen, the number on the right displays the previously set VALVE MIN value, while the number on the left shows the current valve opening percentage.

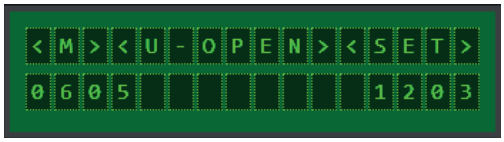
To set the fully closed valve position, first press and hold button until the valve is completely closed. When the valve is fully closed, the text <SET> will appear on the right side of the screen. Visually confirm that the hand lever on the valve is no longer moving. Then, press SET button to save the VALVE MIN value. To return to the main menu without saving the new value, press MENU button.

5.2.7. Valve Max



This function is used to set the fully opened valve position.

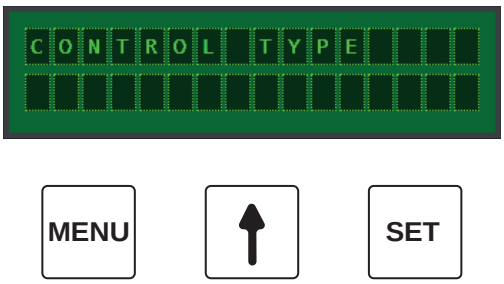
Press SET button to enter the function menu.



On this screen, the number on the right displays the previously set VALVE MAX value, while the number on the left shows the current valve opening percentage.

To set the fully opened valve position, press and hold the button until the valve is fully open. When the valve reaches its fully open position, the text <SET> will appear on the right side of the screen. Visually confirm that the hand lever on the valve is no longer moving. Then, press SET button to save the VALVE MAX value. To return to the main menu without saving the new value, press MENU button.

5.2.8. Control Type

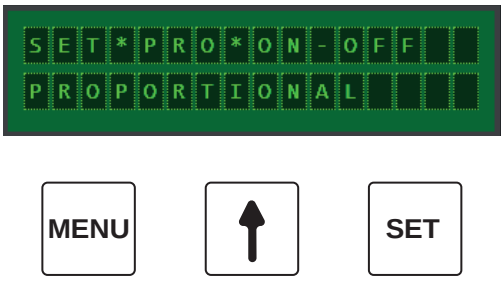


This function is used to set the control type of the SK 3400. There are two control types available: Proportional and On-Off.

In Proportional Control, the water level is regulated by continuously sending proportional control signals to the valve.
In On-Off Control, the valve or pump is operated based on a predefined control band. If the water level falls below the lower limit of the band, the valve or pump is activated (opened or started). If the water level rises above the upper limit of the band, the valve or pump is deactivated (closed or stopped).

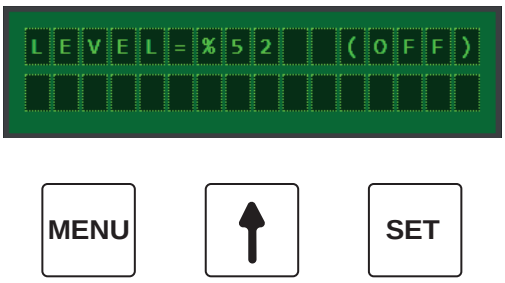
Press SET button to enter the function menu.

MENU (SET) Saves the changes and returns to the main menu.



(PRO) Proportional control type: In this mode, the valve is controlled continuously based on the deviation from the setpoint, allowing precise regulation of the water level.

SET (ON-OFF)On-Off control type. In this mode, the valve or pump operates based on a defined control band. It switches fully on or off depending on whether the water level is below or above the set limits.

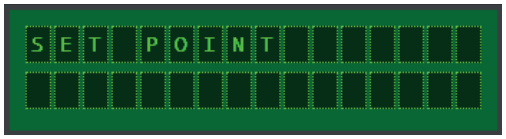


When the On-Off control type is active, the main screen appears as shown in the figure on the right.

When the valve or pump is being opened or activated, (ON) appears on the right side of the screen.

When the valve or pump is being closed or deactivated, (OFF) is displayed on the right side of the screen.

5.2.9. Set Point



The setpoint is the reference water level that is intended to remain stable during operation.
This value must be set between the PROBE MIN LEVEL (0% water level) and PROBE MAX LEVEL (100% water level) limits. Press SET button to enter the function menu.

On this screen, the number on the right displays the previously adjusted setpoint value, while the left side is used to enter a new setpoint value.

Use ↑ button to change each digit, and

SET button to move to the next digit.

After changing the final digit, pressing SET button

saves the new value and returns to the main menu.

To return to the main menu without saving the

changed value, press MENU button.

5.2.10. Control Band

This function is used to set the control band for the water level.
This value defines the allowable range around the Setpoint and uses it as a reference.
For example, if the control band is set to 10%, and the setpoint is 50%, the water level will be controlled between 45% and 55%.
This setting is valid for both Proportional and On-Off control modes.

Press SET button to enter the function menu.

On this screen, the number on the right displays the previously adjusted control band value, while the left side is used to enter a new control band value.

Use ↑ button to change each digit, and

SET button to move to the next digit.

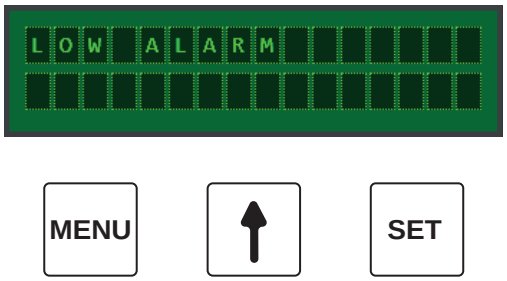
After changing the final digit, pressing SET button

saves the new value and returns to the main menu.

To return to the main menu without saving the

changed value, press MENU button.

5.2.11. Low Alarm



The SK 3400 provides a low-level alarm relay output when the boiler water level falls to a critically low point. Press SET button to enter the function menu.

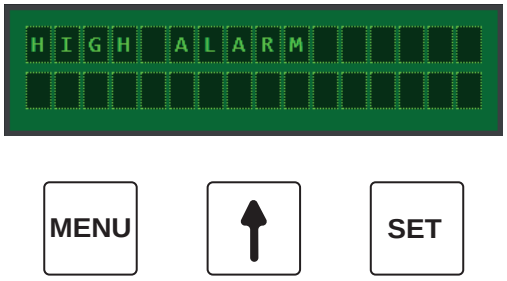
On this screen, the number on the right displays the previously adjusted low alarm value, while the left side is used to enter a new low alarm value.

Use button to change each digit, and SET button to move to the next digit.

After changing the final digit, pressing SET button saves the new value and returns to the main menu.

To return to the main menu without saving the changed value, press MENU button.

5.2.12. High Alarm



The SK 3400 provides a high-level alarm relay output when the boiler water level reaches a critically high point. Press SET button to enter the function menu.

On this screen, the number on the right displays the previously adjusted high alarm value, while the left side is used to enter a new high alarm value.

Use button to change each digit, and SET button to move to the next digit.

After changing the final digit, pressing SET button saves the new value and returns to the main menu.

To return to the main menu without saving the changed value, press MENU button.

5.2.13. Alarm Delay

This function is used to prevent false alarms caused by water level fluctuations.

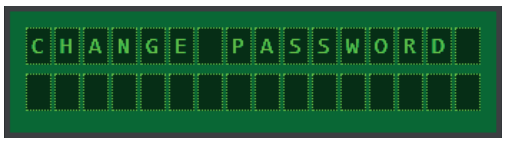
The alarm delay value is displayed in seconds. Press SET button to enter the function menu.

On this screen, the number on the right displays the previously adjusted alarm delay time, while the left side is used to enter a new alarm delay time.

Use button to change each digit, and SET button to move to the next digit.

After changing the final digit, pressing SET button saves the new value and returns to the main menu. To return to the main menu without saving the changed value, press MENU button.

5.2.14. Change Password

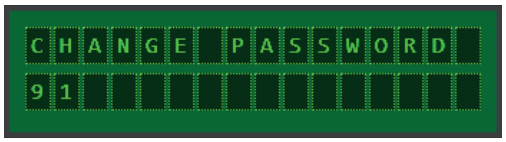


To prevent unauthorized access, the SK 3400 is equipped with password protection.

This function is used to change the device's password.

Press SET button to enter the function menu.

Use button to change each digit, and SET button to move to the next digit.



After modifying the last digit, pressing SET button saves the new password and returns to the main menu.

To return to the main menu without saving the changed value, press MENU button.

6. Troubleshooting

6.1 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: Is the capacitive probe correctly installed, grounded, and calibrated?
For further diagnosis, please refer to the SD 3400 installation and operating manual.

6.2 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.

6.3 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.

6.4 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.

6.2 Fault Finding List For Troubleshooting

Screen does not light up - No function fault No display on screen.	**Remedy** Check the power supply and inspect the device fuse.
Level fluctuation fault Level reading fluctuates excessively.	**Remedy** - Ensure the probe's Min/Max range is not too narrow; adjust for the maximum possible span. - Verify that shielded cable is used to minimize electrical noise and interference.
Level reading fault Level reading rapidly shifts between 0% and 100%	**Remedy** The probe may be faulty. Please contact service for inspection or replacement.
Valve position problem Valve position remains fixed or is limited in movement.	**Remedy** - The valve may be jammed and unable to open or close properly. - The valve position feedback signal (potentiometer) may be faulty. - There may be an issue with the control relays. - The valve Min/Max settings may be incorrectly configured.
Insufficient water supply to maintain setpoint Level does not reach the setpoint even with valve fully open	**Remedy** The valve may be undersized. Review and verify valve sizing.
Improper probe mounting. Level reading fluctuates unstably	**Remedy** The probe mounting socket may be too long or incorrectly installed. Ensure correct installation by threading the probe directly into the flange to avoid application errors.

Table 3 : Troubleshooting Table

7. 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	SD 3400 Capacitive Level Probe Input
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	2x16 LCD Display 3 Buttons
Housing	Housing material, base: black polyamide 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 40 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 4 : Technical Informations

8. 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.

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