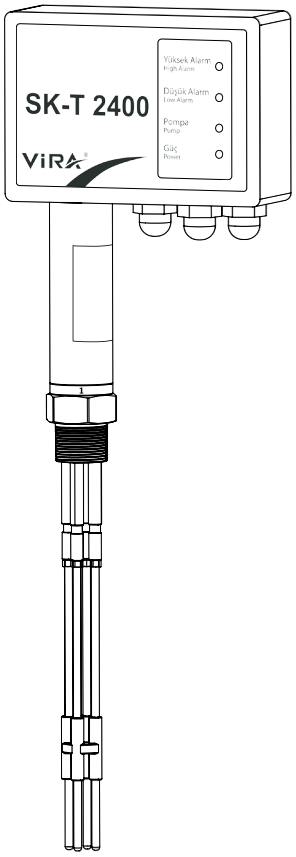
SK-T 2400
Compact Level Controller

Installation, Operating and Maintenance Instructions



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 Information

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

CE Type Approval

The SK-T 2400 compact level controller 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.

Danger!

When loosing the level electrode steam or hot water might to escape. This presents the danger of severe scalds to the whole body.

Do NOT remove the level probe unless the boiler pressure is verified to be 0 bar.

The level switch becomes hot during operation.

Risk of severe burns to face, hands and arms.

Before carrying out installation and maintenance work make sure that the equipment is cold.

Tools

Before starting work, make sure that you have suitable tools and consumables available.
Use only genuine Vira replacement parts.

Temperature

After isolation, let the temperature to cool down to avoid danger of burns.

Freezing

Required precautions must be taken to protect products in environments where they may be exposed to temperatures below freezing point.

Pressure

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Do not assume that the system has depressurized even when the pressure gauge indicates zero. exposed to temperatures below freezing point.

Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

Residual Hazards

The external surface of the product may be very hot. Take essential care when removing the product from an installation.

Hazardous Environment

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

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.

Supervision

All work must be carried out or 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.

Disposal

Unless otherwise stated in the Installation and Operation Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

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.

Safety Note – Specific for level control and alarm (limiting) Products in steam boilers

•Two independent low water limiting / alarm systems must be installed on steam boilers. Level probes must be installed in separate protection tubes/chambers, with sufficient clearance between the tips, and earth.

•Each probe must be connected to an independent controller. The alarm relays must isolate the boiler heat supply at low alarm status.

•A high water alarm may be part of the water level control, or a separate system. An independent high water alarm system must be fitted if it is considered a safety requirement. In this case, the relays must simultaneously isolate the feedwater supply and the boiler heat supply at high alarm status. All boiler water limiters/alarms require regular functional testing.

•A suitable water treatment system must be used to ensure continuous safe and correct operation of the control and alarm (limiter).

Products / systems must be selected, installed, operated and tested in accordance with:

- Local or National standards and regulations (EN 12952, EN 12953, TS 2025 and etc.)
- The requirements of Approval Authorities (Local or International)
- Boiler Insurance Bodies
- Boiler Manufacturer's Specifications
- Guidance Notes systems. Consult a competent water treatment company.

Note: SK-T 2400 Compact level controller does not have self monitoring function. Therefore, it should not be considered as an independent level limiter. An additional self monitoring level limiter must be used.

2. General Information

2.1 Intended Use

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

2.2 Function

The SK-T 2400 Compact type level control system consisting of a level electrode with four tips and an integrated level controller. The compact type level control system is designed for use with various conductive liquids from salt solutions or boiler water to condensate having an electrical conductivity as low as 10 µS /cm at 25 °C.

The compact type level control system 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 integrated 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. The Pump LED lights up when the level controller has switched the feedwater pump on. Power, alarm and pump indications are displayed by LEDs.

Typical Applications

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

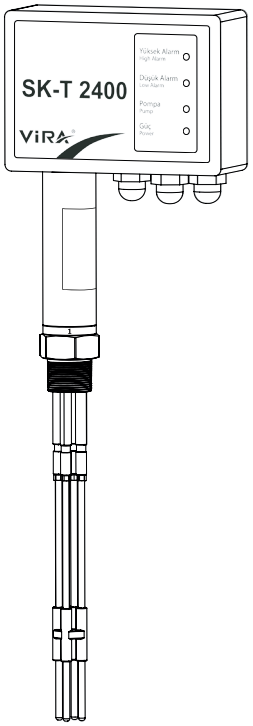


Figure 1 : Perspective View of SK-T 2400

2.3 How It Works?

The SK-T 2400 has four extension tips which can be cut to the desired length on installation to give the required switching levels. The probe body is earthed through its 1" screwed connection, and the boiler or tank naturally forms the earth return path. If the probe is to be used in a non-conductive tank, use one of the tips as an earth return or provide a separate earthing rod or plate.

When a tip is touched by a conductive liquid, it completes an electrical circuit to earth. When the level drops below the tip, the resistance to earth increases, signalling the controller that the tip is not in contact with the liquid.

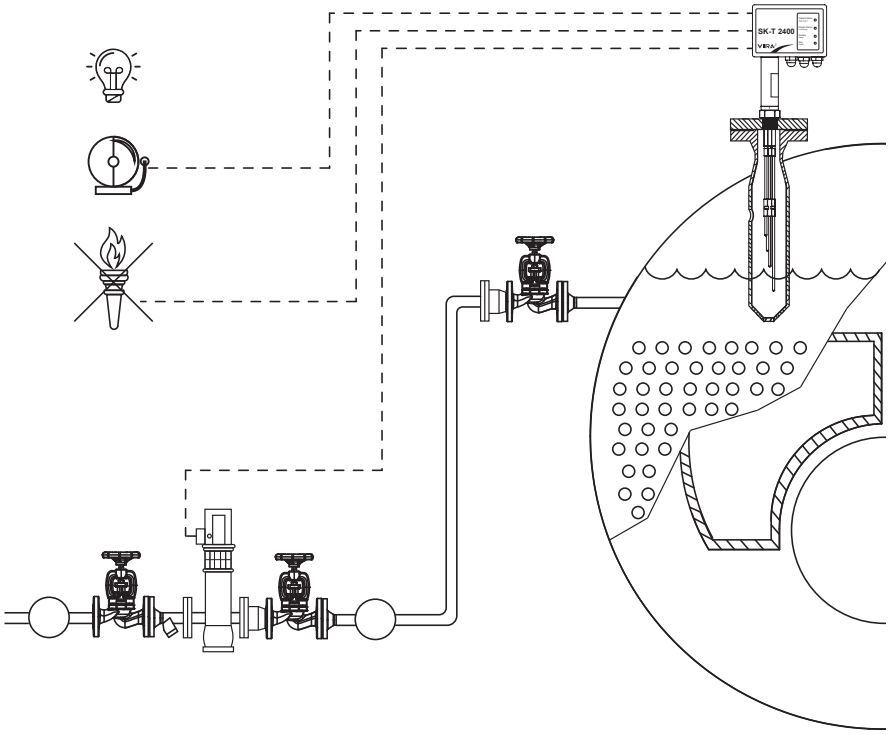


Figure 2 : SK-T 2400 System Application

Scope of Supply

- 1 *SK-T 2400 Compact Level Control System
- 1 *Installation and Maintenance Instructions
- 1 *Joint Ring

3. Technical Information

3.1 Technical Information of Mechanical Part

Service Pressure and Temperature

PN 40, 32 Barg at 239°C

Mechanical Connection

1” BSP Taper Thread

Materials

Screw-in Body	**:**	Stainless Steel
Electrode Rods	**:**	Stainless Steel
Insulation of Electrodes	**:**	PTFE
Tip Steady	**:**	PTFE

Electrode Rods

Length Supplied	**:**	1000 mm (Standard Length)
Diameter	**:**	5 mm

Note : 500,1000 and 1500 mm lengths are available.

3.2 Technical Information of Electrical Part

Supply Voltage	220 VAC (+5% /- 10%), 50/60 Hz
Fuse	external 0.5 A (semi-delay)
Power Consumption	2 W
Electrical Connection of Compact Level Controller	3 * PG 9 Gland
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 T3A 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	Aluminum
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 66 to EN 60529
Weight	approx. 2 kg
Ambient Temperature	0 °... 75 °C
Transport Temperature	–20 ... +80 °C
Storage Temperature	–20 ... +75 °C
Relative Humidity	max. 95%, no moisture condensation
Approvals	CE Type Approval, EMC, LVD, Machine Directive

Table 1 : Technical Informations

4. Installation

4.1 Mechanical Installation

Warning!

- Install the level probe only in vertical position.
- Do not bend probe tips when mounting.
- Do not insulate electrode thread with hemp or PTFE tape.
- Observe the minimum distances for the installation of electrode.
- Do not expose electrode tips to physical shocks.
- Do not apply conductive paste or grease to the electrode thread! Do not use excessive tape!
- Make sure that the air distance between the electrode tips and earth is not less than 14mm!
- The tip steady provides lateral support as well as insulating the tips from each other.

Warning!

The tip steady is an essential part of the probe and must be fitted. Failure to fit the tip steady may lead to short-circuits between the tips, or by the tips touching the protection tube - a potentially hazardous situation.

4.1.1 General

For steam boiler applications, the probe may be installed in an external chamber or inside the boiler.

- For the approval of the boiler standpipe the relevant regulations must be considered.
- Refer to page 9 and 10 for typical installation examples.

4.1.2 Mechanical Installation Procedure

- Determine the measuring lengths of the electorde tips and enter the lengths in the table “Functions”
- Cut the electrode tips to desired lengths with a bolt cutier or spiral grinding machine.
- Deburr the end faces of the electrode tips.
- Position the PTFE tip steady.
- Place the tip steady over the end of the tips.
- Use provided M5 snap ring not to cause any sliding of tip steady.
- Fit the second tip steady.(if needed)
- Tighten the connector lock-nuts.
- Check sealing surfaces
- Place supplied joint ring onto seating surface of the threaded standpipe of flange.
- Use up to three turns (no more) of PTFE thread sealing tape on the probe thread.
- Fit and tighten the probe by hand initially. Screw the level probe into the threads or flange and tighten with a 41 mm open-end spanner.
- Due to the nature of a taper/parallel joint it is not possible to recommend tightening torque figures.

Warning!

Failure to tighten the connector lock-nuts may cause the tips loosing or falling off.

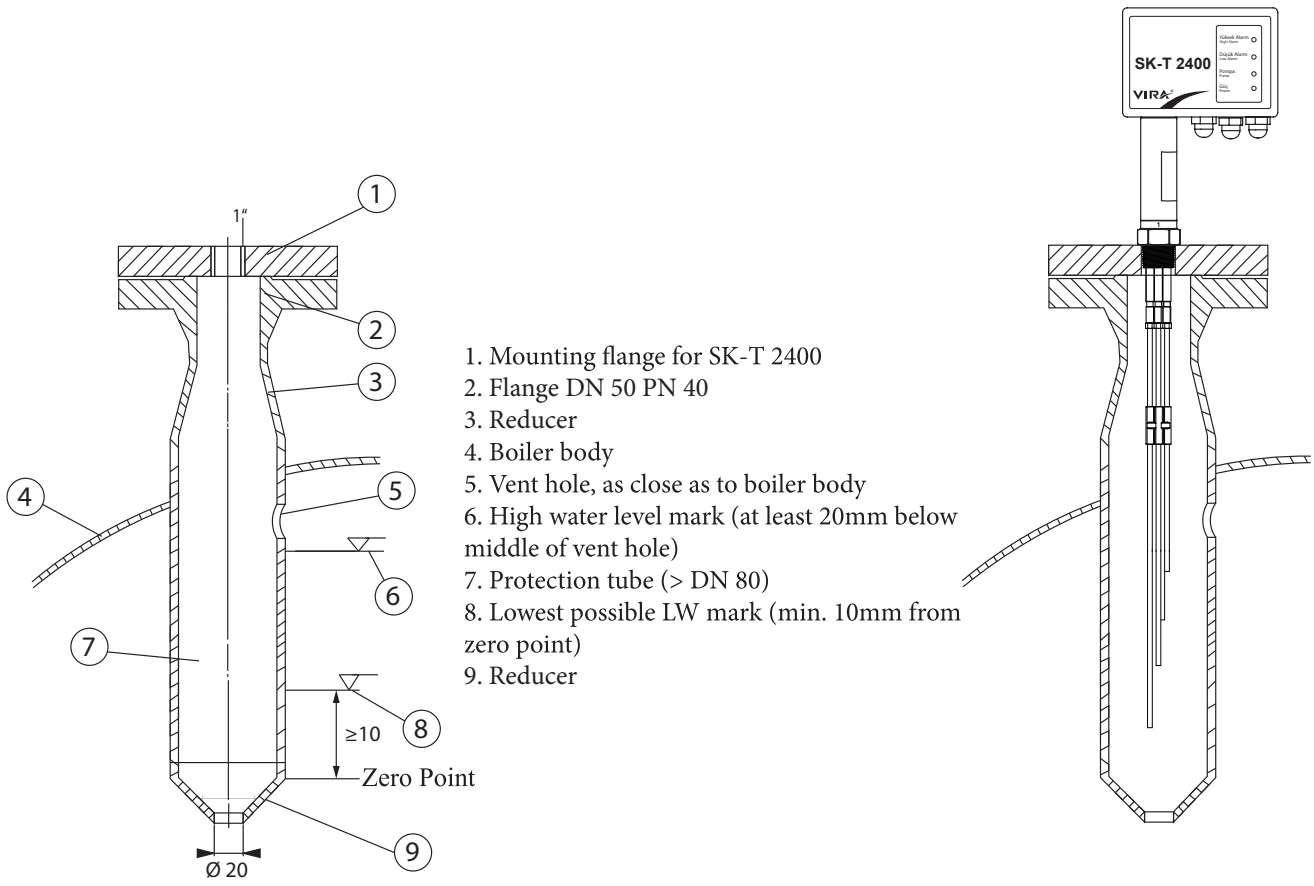
4.1.3 Table Functions

The function table should be used to avoid errors to remember the lenghts of electrode tips and functions.

Function	Color	Electrode No	Length (mm)
Alarm 1		1	
Pump Off		2	
Pump On		3	
Alarm 2		4	

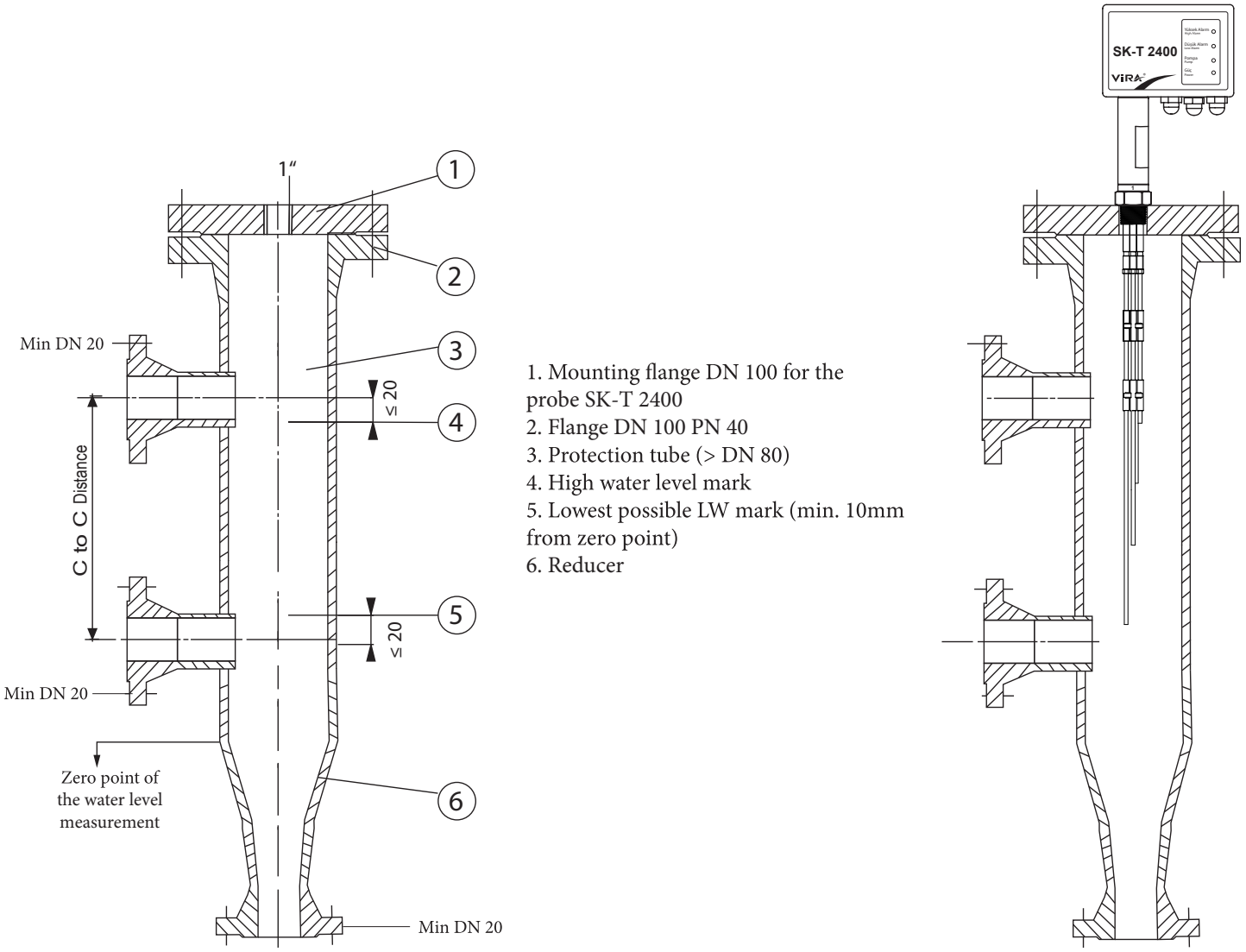
Table 2 : Functions

4.1.4 Examples of Installation



1. Mounting flange for SK-T 2400
2. Flange DN 50 PN 40
3. Reducer
4. Boiler body
5. Vent hole, as close as to boiler body
6. High water level mark (at least 20mm below middle of vent hole)
7. Protection tube (> DN 80)
8. Lowest possible LW mark (min. 10mm from zero point)
9. Reducer

Figure 3 : Installation Example 1, Usage With Protection Tube Inside The boiler.



1. Mounting flange DN 100 for the probe SK-T 2400
2. Flange DN 100 PN 40
3. Protection tube (> DN 80)
4. High water level mark
5. Lowest possible LW mark (min. 10mm from zero point)
6. Reducer

Figure 4 : Installation Example 2, Usage With Protection Tube Outside The Boiler.

Note : The lowest water level should be higher than the zero point.

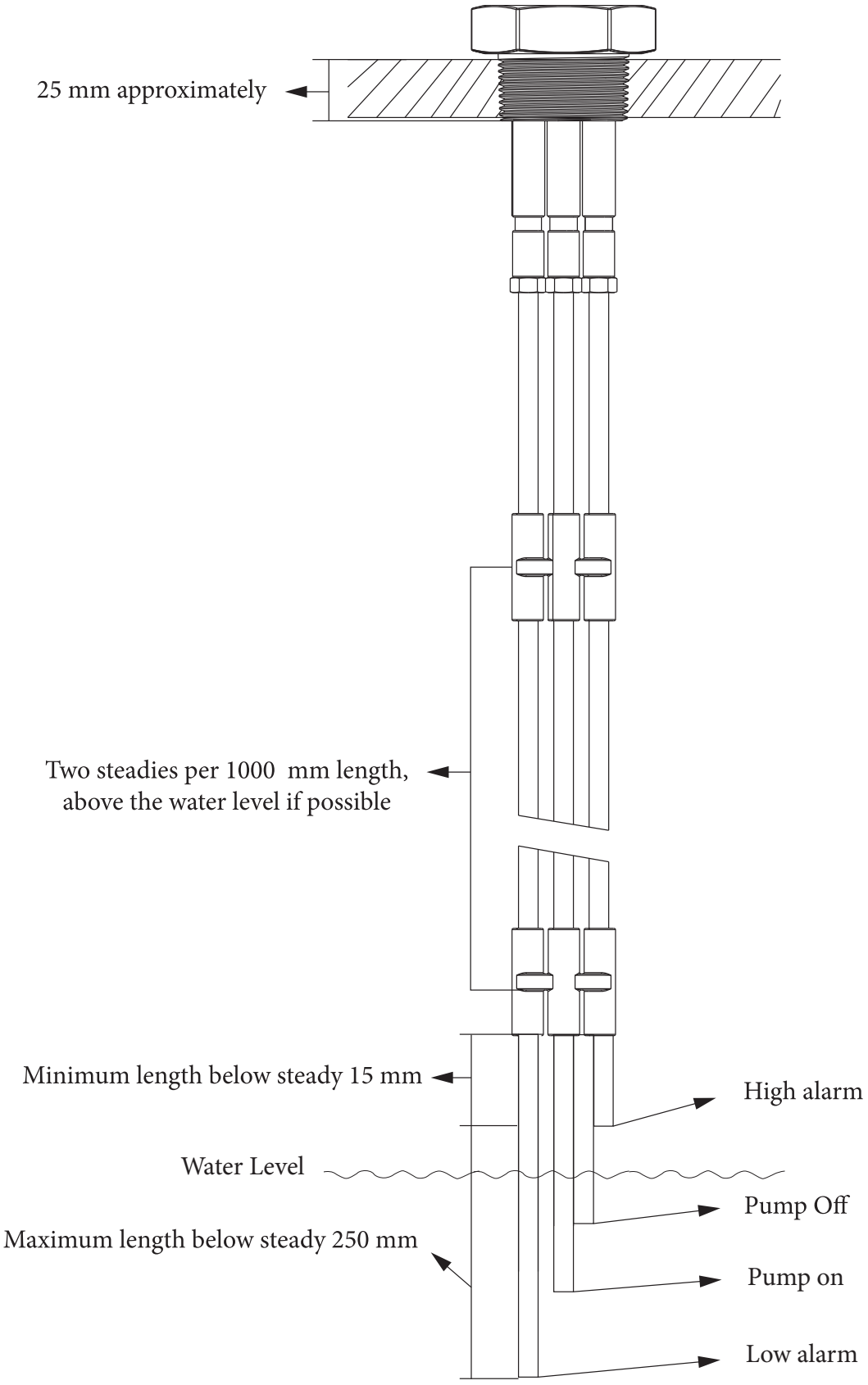


Figure 5 : Electrode Length Indication

4.1.5 Dimensions and Material Description

Item	Description
1	Led " High Alarm"
2	Led " Low Alarm"
3	Led " Pump"
4	Led "Power"
5	Cable Gland PG9
6	Housing screws M4
7	Housing Cover
8	Housing
9	Label (Laser Marking)
10	Probe Body
11	Lock Nuts
12	Probe Tips
13	PTFE Tip Steady

Table 3 : Wiring Diagram Index

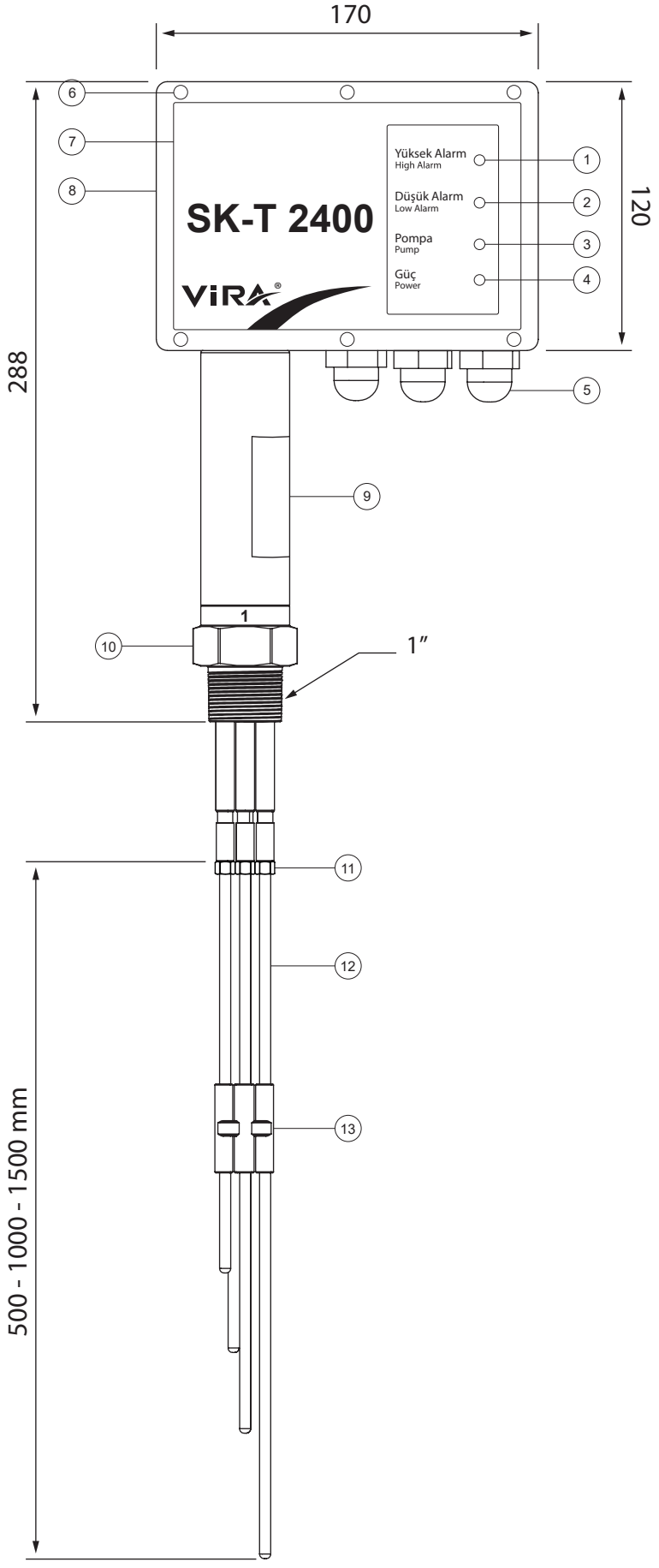


Figure 6 : SK-T 2400 Compact Level Controller Dimensions

4.2 Electrical Installation

4.2.1 Wiring Diagram

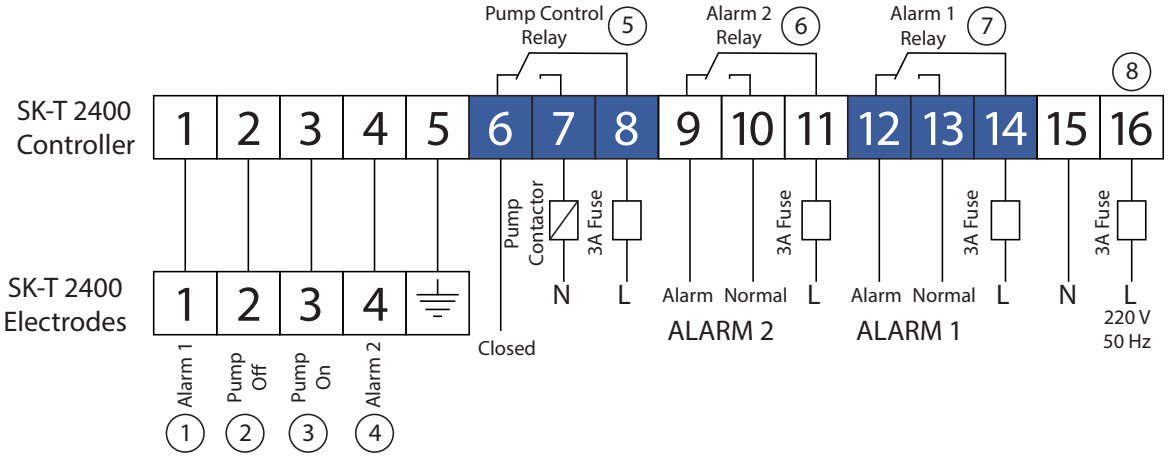


Figure 7 : SK-T 2400 Wiring Diagram

Item	
1	Alarm 1 (High/Low) probe tip (High Level as default), de energizing delay 3 seconds
2	Pump off probe tip
3	Pump on probe tip
4	Alarm 2 (High/Low) probe tip (Low Level as default), de energizing delay 3 seconds
5	Output Contact (On/Off) for pump activation (Inlet control as default)
6	Alarm 2 (High/Low) output contact (Low Level as default), de energizing delay 3 seconds
7	Alarm 1 (High/Low) output contact (High Level as default), de energizing delay 3 seconds
8	Supply voltage connection 220VAC with semi-delay fuse M 3A provided on site

Table 4 : Wiring Diagram Index

Wiring between electrodes and controller is default as following ;

Electrode Number 1 : High Level Alarm

Electrode Number 2 : Pump Off

Electrode Number 3 : Pump On

Electrode Number 4 : Low Level Alarm

4.2.2 Supply Voltage Connection

The equipment must be supplied with 220Vac from a power supply. An external 3A semi-delay fuse must also be fitted.

4.2.3 Connection of Output Contacts

Wire the terminals between 6-14, (Fig. 7) according to the desired switching functions. Provide an external slow-blow 3A fuse for the output contacts.

4.2.5 Tools

Screwdriver size 3 x 100 mm.

4.3 Name Plate

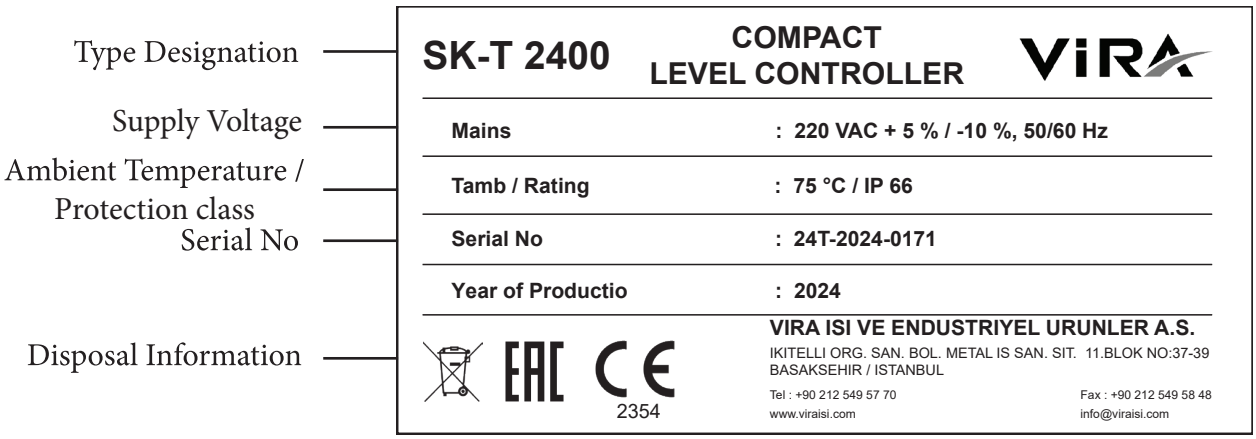


Figure 8 : SK-T 2400 Name Plate

5. Connection Types

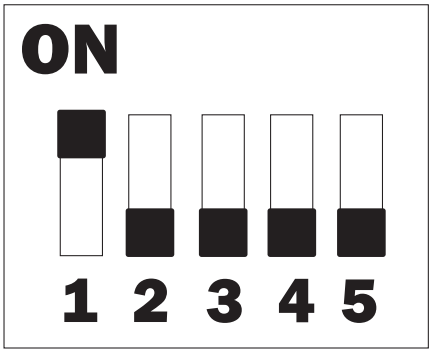
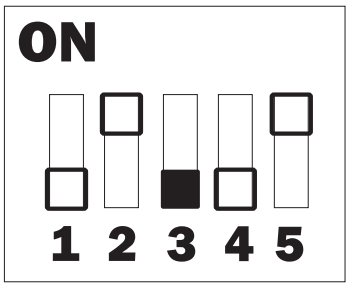
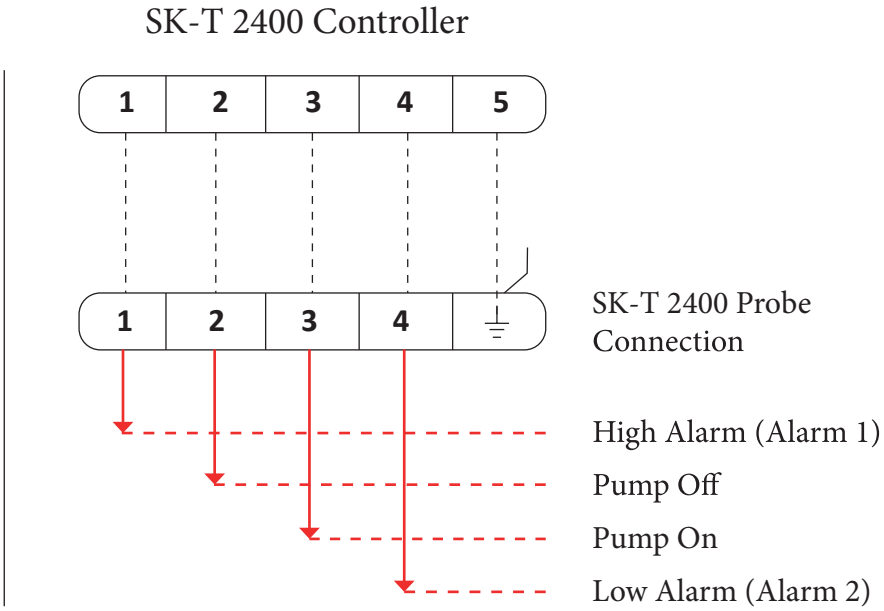


Figure 9 : 5 Pole Dipswitch

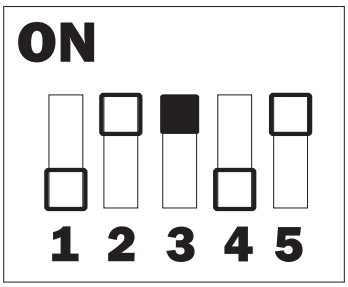
5.1 Inlet or Discharge Control (Dip Switch Pole 3)

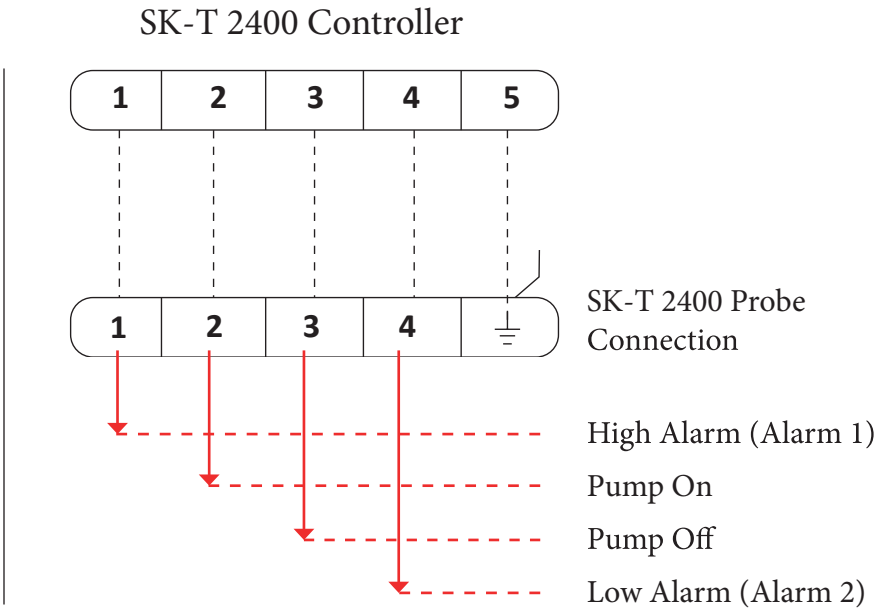
5.1.1 Inlet Control





5.1.2 Discharge Control



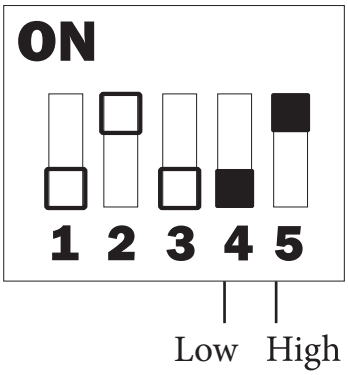


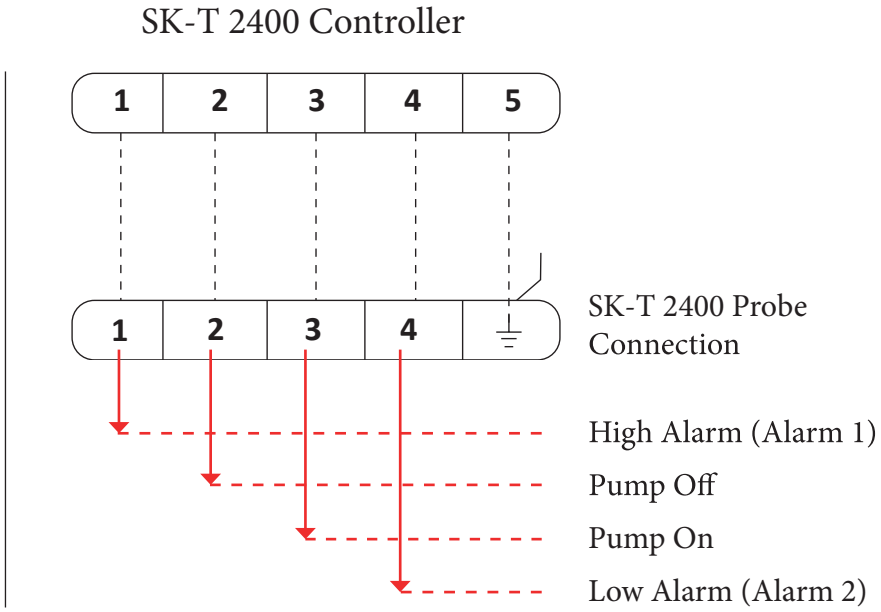
5.2 Alarm 1 and Alarm 2 (Dip Switch Pole 4 and 5)

Alarm 1 and alarm 2 can be configurated in 4 different ways as following;

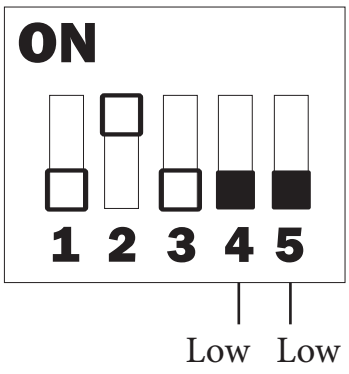
Dip switch pole number 5 : Alarm 1

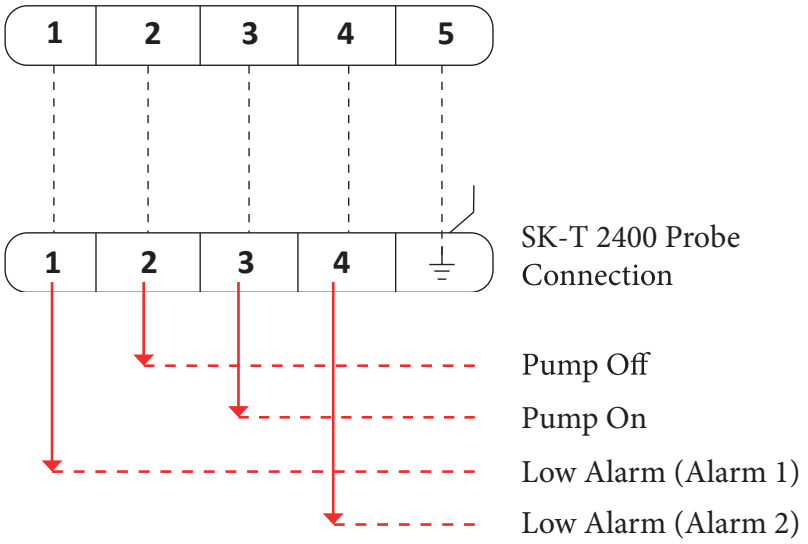
Dip switch pole number 4 : Alarm 2



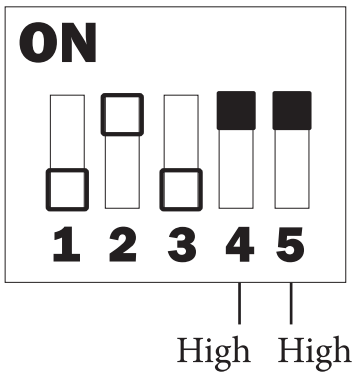


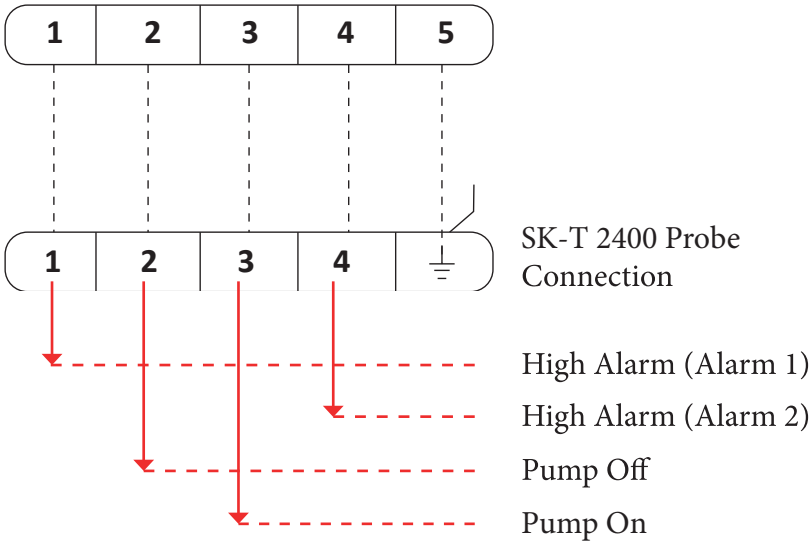
SK-T 2400 Controller



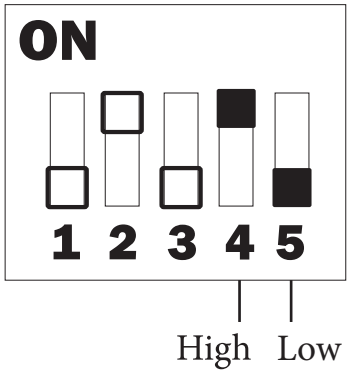


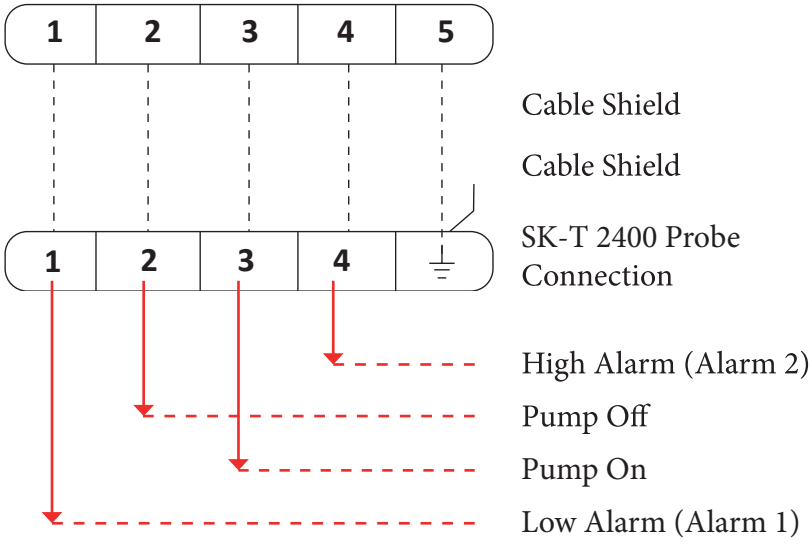
SK-T 2400 Controller





SK-T 2400 Controller

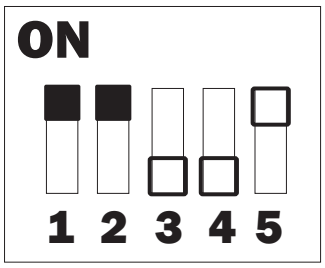




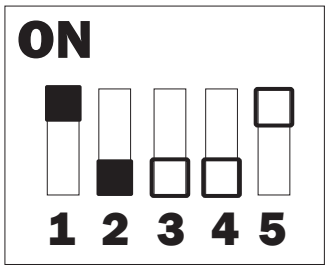
5.3 Alarm Delay (Dip Switch Pole 1 and 2)

Alarm delays can be configurated by dip switches pole 1 and 2.

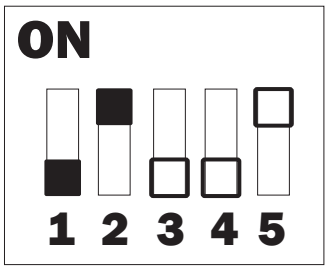
1 Second



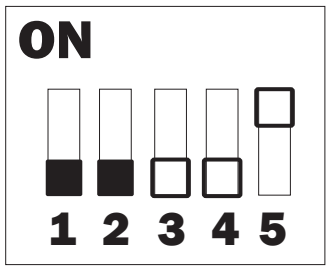
3 Seconds (Default)



5 Seconds



7 Seconds

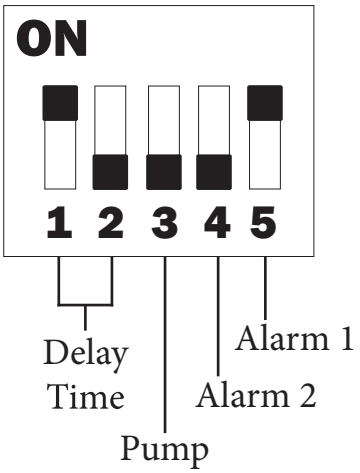


Note : According to EN standards; the maximum response delay shall not exceed 3 seconds.

6. Commissioning

6.1 Factory Settings

- **De-energizing delay** : 3 seconds (factory set)
- **Function** : Inlet Control
- **Alarm 1** : High Alarm
- **Alarm 2** : Low Alarm



6.2 Changing Factory Settings

Danger !

The terminal blocks of the equipment is live during operation. There is a risk of serious injury due to electric shock! Always cut off the power supply to the equipment before installing, removing or connecting the terminal blocks!

6.3 Changing the function and input of the level controller

The input and function are determined by the setting of dip switch. Please see figure 10 to reach dip switch on controller.

- Switch off the supply voltage before any change.

When the changes are complete:

- Switch the supply voltage back on. The equipment restarts.

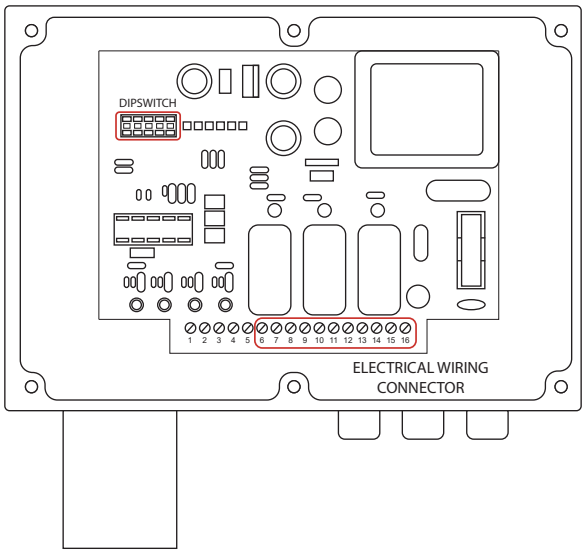


Figure 10 : Dipswitch Position

6.4 Checking the switchpoints and function

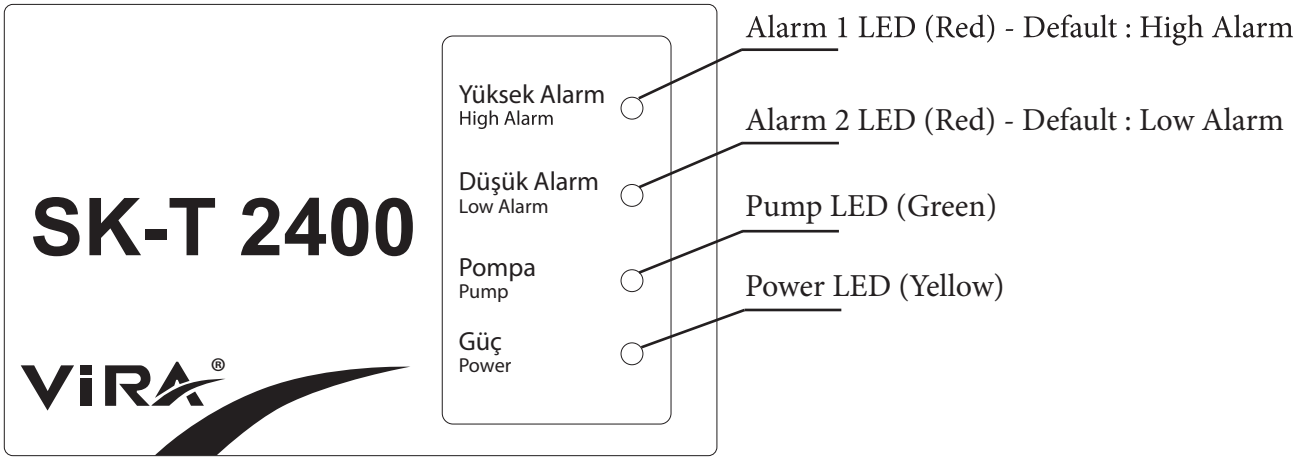


Figure 11 : Front Label Of The Controller

Start

Action	Operation	Status
Switch on supply voltage	The power led lights yellow	The system is started and tested

Normal Operation

Action	Operation	Status
The system is working within the desired parameters	Power LED lights up yellow Depending on the water level, the Alarm LEDs (Alarm 1 or Alarm 2) and Pump LED lights up	Status display during normal operation

Checking the switchpoint and function (Min Alarm)

Action	Operation	Status
Reduce the water level until it is below the Min Level. The min probe tip is no longer immersed.	Led Alarm 2 (or Alarm 1) lights up red depending on the configuration. **Factory Setting;** **Alarm 1 :** High Level (MAX) **Alarm 2 :** Low Level (MIN)	The off delay is in progress. When delay time elapsed, the MIN alarm relay is de-energised. MIN output contacts 10/11 closed, 9/11 are open. **Factory Setting;** **Delay time :** 3 seconds

Checking the switchpoint and function (Max Alarm)

Action	Operation	Status
Increase the water level above the Max. Level. The max. probe tip is immersed.	Led Alarm 1 (or Alarm 2) lights up red depending on the configuration. **Factory Setting;** **Alarm 1 :** High Level (MAX) **Alarm 2 :** Low Level (MIN)	The off delay is in progress. When delay time elapsed, the MAX alarm relay is de-energised. MAX output contacts 13/14 closed, 12/14 are open. **Factory Setting;** **Delay time :** 3 seconds

Checking the switchpoint and function (Inlet Control)

Action	Operation	Status
Reduce the water level until it is below the “Pump On”. The “pump on probe tip” is no longer immersed.	The Pump LED lights up green	The pump relay is energised. Pump output contacts 7/8 open, 6/8 are closed.
Fill the boiler until the water level above the “Pump Off”. Level. The “pump off probe tip” is immersed.	The Pump LED does not light up	The pump relay is de-energised. Pump output contacts 6/8 open, 7/8 are closed.

Checking the switchpoint and function (Discharge Control)

Action	Operation	Status
Fill the boiler until the water level above the “Pump Off”. Level. The “pump off probe tip” is immersed.	The Pump LED does not light up	The pump relay is de-energised. Pump output contacts 7/8 open, 6/8 are closed.
Reduce the water level until it is below the “Pump On”. The “pump on probe tip” is no longer immersed.	The Pump LED lights up green	The pump relay is de-energised. Pump output contacts 6/8 open, 7/8 are closed.

6.5 Normal Operation

Cycle

The water level drops below the “Pump On” water level switchpoint. The Pump LED lights up green. The pump relay is energised. Pump output contacts 7/8 open, 6/8 are closed.

The water has risen above the “Pump OFF” water level switchpoint. The Pump LED does not lights up. The pump relay is de-energised. Pump output contacts 6/8 open, 7/8 are closed.

High Alarm Case

The water is above the “MAX level” switchpoint. LED High Alarm (Alarm 1) lights up red. The off delay is in progress. Delay time elapsed and the MAX alarm relay is de-energised. MAX output contacts 13/14 closed, 12/14 are open.

Low Alarm Case

The water has dropped below the “MIN level” switchpoint. LED Low Alarm (Alarm 2) lights up red. The off delay is in progress. Delay time elapsed and the MIN alarm relay is de-energised. MIN output contacts 10/11 closed, 9/11 are open.

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?

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.

7.5 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 with the 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 5 : Troubleshooting Table

If faults occur that are not listed above or cannot be corrected, please contact our service centre or authorized agency in your country.

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.

VİRA ISI VE ENDÜSTRİYEL ÜRÜNLER A.Ş

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

Phone: +90 212 549 57 70 Fax: +90 212 549 58 48

Web: www.viraisi.com E-mail: info@viraisi.com