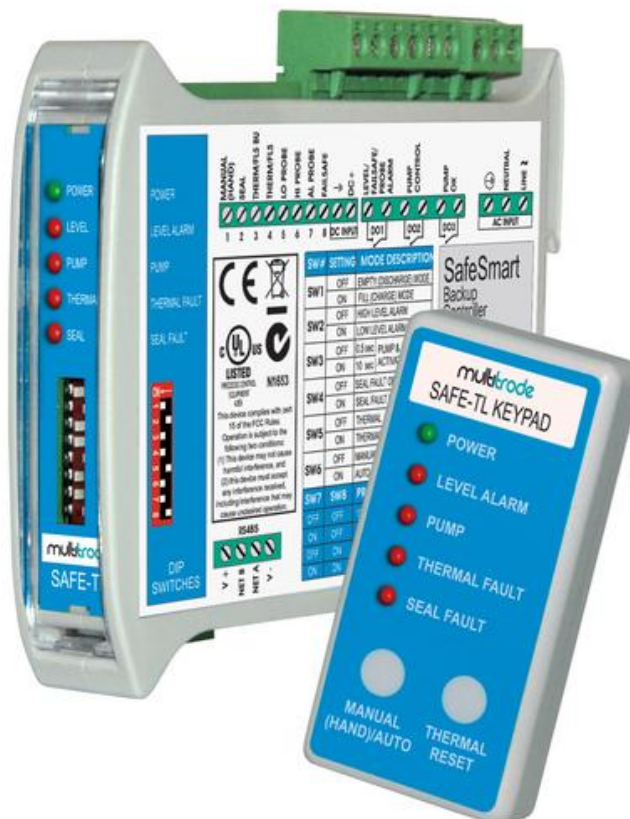


SAFESMART Backup Controller SAFE-TL

Installation & Operation Manual



This Manual is the support documentation for the installation, commissioning and operation of the SafeSmart-TL Backup Controller.

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1 Warnings & Cautions

1.1 Information to User



WARNING:

Do not use this unit in environments that may contain flammable/explosive or chemically aggressive gases or powders.

Read this manual prior to installing or operating the SafeSmart-TL Backup Controller. It contains all the information necessary to configure it for maximum performance for your application. After reading, place the manual in a safe place for future reference.

1.2 Documentation Standards

**DANGER:**

This symbol is used where non-compliance could result in injury or death.

**WARNING:**

This symbol is used where non-compliance could result in incorrect operation, damage to or failure of the equipment.

**NOTE:**

This symbol is used to highlight an issue or special case within the body of the manual.

1.3 Installation Notes

**WARNING:**

The SafeSmart-TL installation and wiring must be performed by qualified personnel.

**DANGER:**

The SafeSmart-TL has no user serviceable parts. To reduce the risk of electric shock leave all servicing to qualified Multitrode technical staff.

2 Introduction



WARNING:

Do not use this unit in environments that may contain flammable/explosive or chemically aggressive gases or powders.

The SafeSmart-TL Backup Controller is a solid-state electronic level control module housed in a hi-impact plastic case with a DIN rail attachment on the back. It is used to control a pump (via a contactor or soft starter) in response to a liquid level sensor such as a MultiTrobe probe.

The TL-Controller can be used as the primary source of control for a single pump or as a backup control device (for a single pump) when the primary control equipment fails. When using a TL-Controller as a backup controller, it only controls the pump in response to high or low level signals from dedicated level sensors.

Pump seal and thermal sensors can be connected to the TL-Controller for pump protection. During operation, the LED indicators on the front panel display the current status including – Pump On/Off, Thermal fault, Seal fault and Level alarm. An optional Mimic Panel (or keypad) allows for remote indication of pump status, manual pump operation and acknowledgment of pump faults.

The TL-Controller is designed to be easy to install and configure. All connections are clearly labelled on the side of the device and options are configured using a set of Dip switches on the front of the Controller.

3 Specifications

Dimensions	
Width	22.5mm (7/8")
Height	101mm (4")
Length (depth)	120mm (4 3/4")
Environmental	
Ambient Temperature	-10 to 60 °C (14 to 140 °F)
Humidity	5% to 90% non-condensing
AC Power Supply	
Voltage Range	85 – 265V AC
Frequency	50/60Hz
Power	3.5W
DC Power Supply	
Voltage Range	12 – 30V DC
Current	0.15A max
Relay Outputs	
Type	Form A
Current (Resistive)	5A
Current (Inductive)	2A
Voltage Rating DC	30V DC
Voltage Rating AC	250V AC
Thresholds*	
FLS Thermal	Fault >4k ohm (Reset <4k ohm)
FLS Seal	Fault < 600 ohm (Reset >600 ohm)
Conductive Thermal	Fault >4k ohm (Reset <2k ohm)
Conductive Seal	Fault > 40k ohm
Therm/FLS BU Input	0.15V DC

Table 1 - SafeSmart-TL Specifications

* Where applicable, values include a 56 ohm series resistor on the thermal input.

4 Installation



WARNING:

Do not use this unit in environments that may contain flammable/explosive or chemically aggressive gases or powders.

General precautions



Electrical Hazard:

- A certified electrician must supervise all electrical work. Comply with all local codes and regulations.
 - Before starting work on the unit, make sure that the unit is isolated from the power supply and cannot be energized.
 - Make sure that all unused conductors are insulated.
 - There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out or if there is fault or damage on the product.
-

Requirements

These general requirements apply for electrical installation:

- The mains voltage and frequency must agree with the specifications for the product.
- Circuit breakers must be installed between the main voltage line and this unit.
- All fuses and circuit breakers must have the proper rating, and comply with local regulations.
- The cables must be in accordance with the local rules and regulations.

Cables

These are the requirements to follow when you install cables:

- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The sheathing must not be damaged and must not have indentations or be embossed (with markings, etc.) at the cable entry.
- The minimum bending radius must not be below the accepted value.

Earthing (Grounding)



Electrical Hazard:

- You must earth (ground) all electrical equipment. This applies to the pump equipment, the driver, and any monitoring equipment. Test the earth (ground) lead to verify that it is connected correctly.
 - If the power cable is jerked loose by mistake, the earth (ground) conductor should be the last conductor to come loose from its terminal. Make sure that the earth (ground) conductor is longer than the phase conductors. This applies to both ends of the power cable.
-

The SafeSmart-TL Backup Controller is designed to be mounted onto a standard DIN rail. The power supply, input and output connections are located on the top of the Controller housing. The RS485 connection to the optional Mimic Panel is located at the bottom of the housing.

The features of the Controller are listed below and are discussed in the following Sections.

- Power Supply Options – 4 different options
- Operation Modes & Probe Inputs
 - Empty (Discharge) Mode
 - Fill (Charge) Mode
- Level Alarm & Probe Faults
 - Level Alarm (AL Probe)
 - Failsafe Probe Fault
 - Assumed Probe Fault
- Pump Sensor Connection Options
 - Seal Fault Connections
 - Thermal Fault Connections
 - Dual Monitoring of Pump Faults
 - Local or Remote Monitoring of Pump Status & Faults
 - MultiSmart and TL Controller Monitoring Pump Faults
- Manual (Hand) Operation
- Pump & Alarm Activation Delays
- Probe Sensitivity
- LED Status Summary
- DIP Switch Settings
- Optional Mimic Panel / Keypad

5 Power Supply Options

The SafeSmart-TL Backup Controller can be supplied power in the following ways:

- 85 – 240V AC Supply Only
- 12 – 30V DC Supply Only
- 85 – 240V AC with 12 – 14V DC as Backup
- 15* – 30V DC with 85 – 240V AC as Backup

* When the DC supply is 15V or greater, the DC supply is the primary source.

A Power LED (steady green) indicates when the Controller is powered. If the LED flashes, supply voltage is too low.



NOTE:

If the power supply is below 24 VDC, the voltage alarm threshold is automatically set to 11.5 V. If the supply is 24 VDC or above, the voltage alarm threshold is automatically set to 23 V.

A switch or circuit-breaker and an over-current protection device must be included in the installation. The protection device must be in close proximity to the equipment, within easy reach of the operator and clearly marked as the protection device for the equipment.

The input wiring and the switch/circuit-breaker/over-current device must be rated to at least the nominal input voltage being used. The recommended current ratings are tabled below.

Unit Supply Range	Recommended Switch/Circuit-Breaker/Over-current Protection Device Rating	Minimum Supply Wiring Rating
85 - 180VAC	0.1A	0.1A
180 - 265VAC	0.05A	0.05A
12 - 20VDC	0.3A	0.3A
20 - 30VDC	0.15A	0.15A

Table 2 – Current Ratings



NOTE:

The MultiTrobe probe uses an earth/ground return path for the signal. Ensure that the GROUND (DC-) terminal on the TL Controller is also grounded.

6 Operation Modes & Probe Inputs

The SafeSmart-TL Backup Controller can be configured to operate in either Empty (Discharge) or Fill (Charge) mode.

- Empty (Discharge) Mode - Dip Switch 1 = OFF
- Fill (Charge) Mode - Dip Switch 1 = ON

The Controller has three (3) probe inputs, Low, High and Alarm. The Alarm probe input can be configured as a low or high level alarm.

- High Level Alarm - Dip Switch 2 = OFF
- Low Level Alarm - Dip Switch 2 = ON

6.1 Empty (Discharge) Mode

This mode is used to pump liquid out of a well once it reaches a preset level. In this mode the Controller operates as follows:

- The pump activates when the liquid reaches the high level probe.
- The pump continues to operate until the liquid level drops below the low level probe and the pump deactivation period expires.
- A thermal fault or seal fault* deactivates the Pump Ok and Pump Control outputs regardless of the liquid level. The pump stops and the appropriate LED, Thermal or Seal flashes.

* The deactivation of the Pump Ok and Pump Control outputs is configurable for the seal fault. If Dip Switch 4 is On, the Pump Ok output (DO3) and Pump Control output do not deactivate so the pump continues to run in the presence of a seal fault.

- Seal Fault Operates DO3 (& DO2) - Dip Switch 4 = OFF
- Seal Fault LED only - Dip Switch 4 = ON

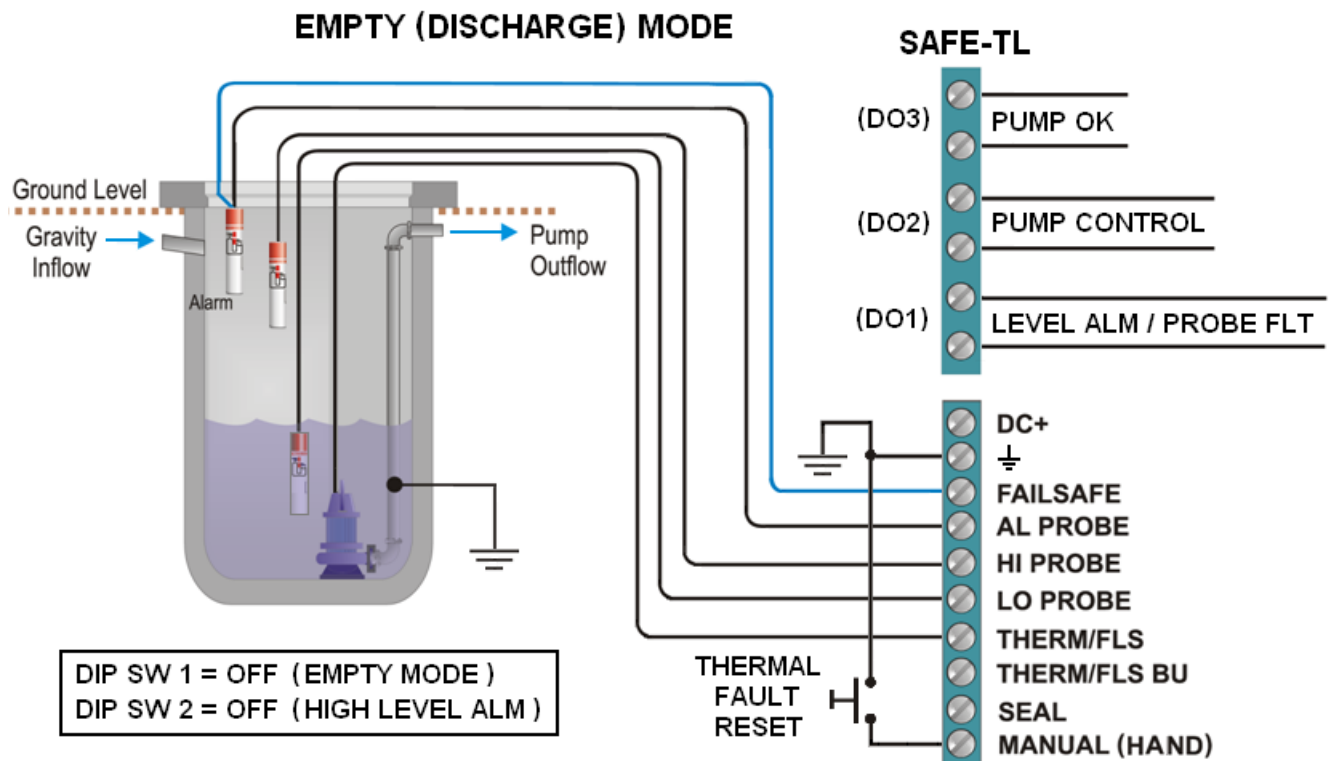


Figure 1 – Empty (Discharge) Mode

6.2 Fill (Charge) Mode

This mode is used to fill up a well with liquid when the level falls to a preset level. In this mode the Controller operates as follows:

- The pump activates when the liquid falls below the low level probe.
- The pump continues to operate until the liquid level reaches the high level probe and the pump deactivation period expires.
- A thermal or seal fault* deactivates the Pump Ok and Pump Control outputs regardless of the liquid level. The pump stops and the appropriate LED, Thermal or Seal flashes.

* The deactivation of the Pump Ok and Pump Control outputs is configurable for the seal fault. If Dip Switch 4 is On, the Pump Ok output (DO3) and Pump Control output do not deactivate so the pump continues to run in the presence of a seal fault.

- Seal Fault Operates DO3 (& DO2) - Dip Switch 4 = OFF
- Seal Fault LED only - Dip Switch 4 = ON

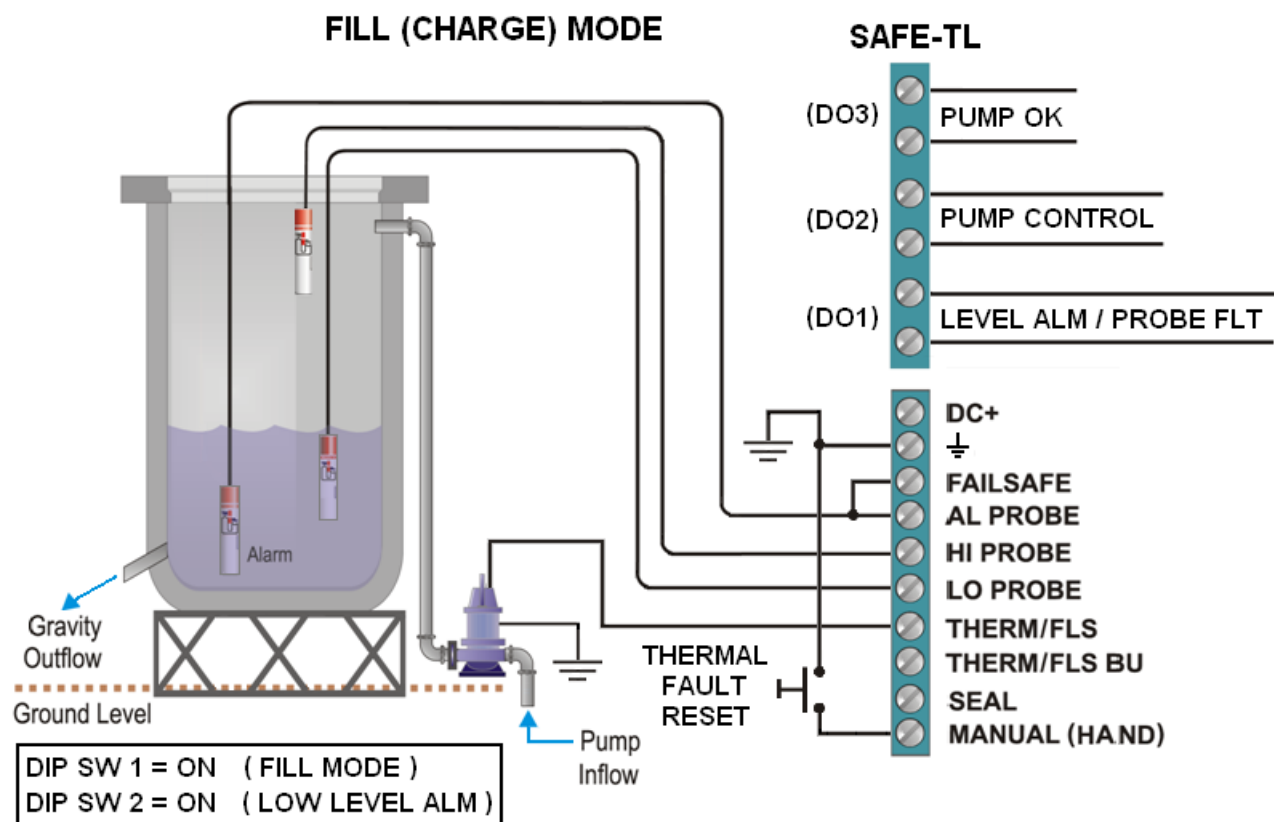


Figure 2 - Fill (Charge) Mode

7 Level Alarm & Probe Faults

7.1 Level Alarm (AL Probe)

A conductive level sensor is connected to the AL Probe input to detect when the liquid level has risen above or fallen below an acceptable level.

In Empty (Discharge) mode this is typically a high level alarm and is activated when the AL Probe input detects liquid and the activation delay has expired.

In Fill (Charge) mode this is typically a low level alarm and is activated when the AL Probe input is no longer detecting level (i.e. the level has dropped below the sensor) and the activation delay has expired.

When a level alarm is detected the Level Alarm output (DO1) is activated and the Level Alarm LED flashes at 1Hz. The Level Alarm output can be used to operate an alarm device such as a beacon.



NOTE:

The Level Alarm LED is also used to indicate Failsafe and Assumed Probe faults. The Level Alarm overrides the probe fault conditions and is always the alarm indicated when more than one alarm is present.

7.2 Failsafe Probe Fault

MultiTrobe probes are available with a failsafe connection to the top-most sensor to enable detection of a probe fault. If a broken cable is detected, the Failsafe Probe Alarm output (DO1) is activated, the Level Alarm LED flashes - double pulse on, 3s off and the pump continues to run.

A Failsafe probe is typically used in discharge (empty) applications only. By its very nature the probes used in a charge or fill application are covered, so for example if the low level alarm probe goes open circuit, a low level alarm would be present immediately.



NOTE:

If a non-failsafe probe is used, then a jumper must be connected between the Alarm Probe and the Failsafe Probe input to suppress erroneous probe faults.



NOTE:

The Failsafe Probe input must be connected to the highest probe in the system for an discharge (empty) application.

7.3 Assumed Probe Fault

For an Empty (Discharge) application, if a High Level probe is activated and the Low Level probe is deactivated, then the Controller assumes the Low Level probe is faulty. This condition is called an “Assumed Probe Fault” and the Level Alarm LED flashes - a single pulse on, 3 seconds off.

The TL-Controller changes its pumping behaviour to a timed method until the fault condition is no longer present. So the pump continues to run for 60 seconds after the High Level probe has deactivated and during this time the Pump LED flashes.

For a Fill (Charge) application, if a High Level probe is activated and the Low Level probe is deactivated, then the Controller assumes the Low Level probe is faulty. This condition is called an “Assumed Probe Fault” and the Level Alarm LED flashes - a single pulse on, 3 seconds off. The Controller changes its pumping behaviour to a timed method until the fault condition is no longer present. So the Controller waits for 60 seconds after the High Level probe has deactivated then starts the pump and during this time the Pump LED flashes.

8 Pump Sensor Connection Options

The following section covers the configuration of the TL-Controller to detect Thermal and Seal faults. The main factor that determines the setup is the type of pump sensors. - conductive thermal & seal or FLS (thermal & seal).

Typically Flygt pumps have either a Flygt Leakage Sensor (FLS) or an FLS10 sensor which detects thermal (motor over temperature) and seal (water in oil) faults.

Other pumps have a thermal sensor (non-linear PTC thermistor or bi-metallic switch) and/or a (conductive) seal sensor.

8.1 Seal Fault Connections

The type of seal sensor determines where on the Controller the sensor is connected to.

- A conductive seal sensor is connected to the Seal input of the Controller.
- An FLS thermal and seal sensor is connected to the Therm/FLS input of the Controller. (No connection is made to the Thermal/FLS/Back Up ("Therm/FLS BU") input unless a MultiSmart is used as the primary pump controller).

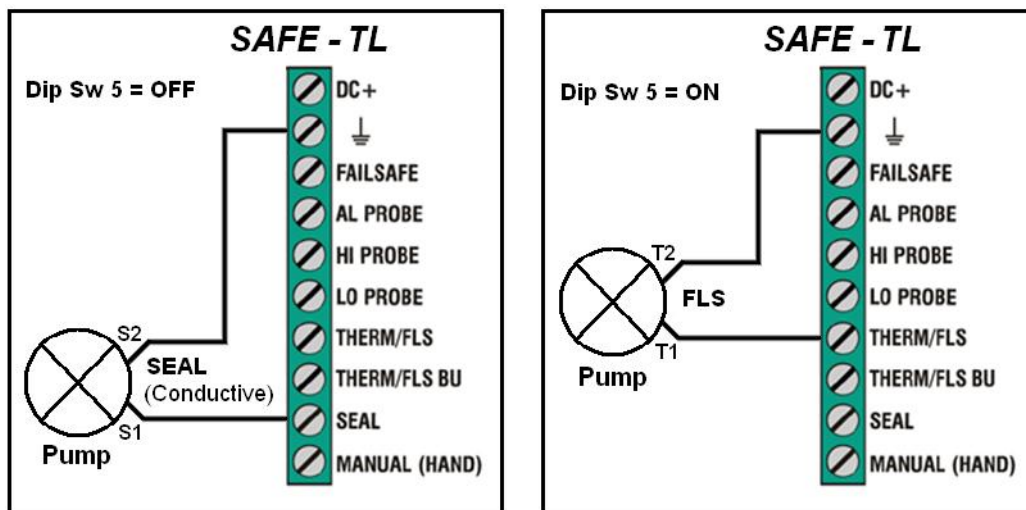


Figure 3 - Seal Connections

When a seal fault is detected, the Pump Ok output (DO3) and Pump Control output (DO2) are deactivated, the pump stops and the Seal Fault LED flashes.

For a seal fault, the Pump Ok and Pump Control outputs can be configured to remain unchanged – i.e. only the Seal fault LED flashes.

- Seal Fault Operates DO3 - Dip Switch 4 = OFF
- Seal Fault LED Only - Dip Switch 4 = ON

The Controller automatically resets a seal fault when the fault is no longer present.

8.2 Thermal Fault Connections

The pump thermal sensor connection to the Controller is the same for both types of Sensors. Dip Switch 5 is used to select the type of sensor.

- Thermal - Dip Switch 5 = OFF
- Thermal / FLS - Dip Switch 5 = ON

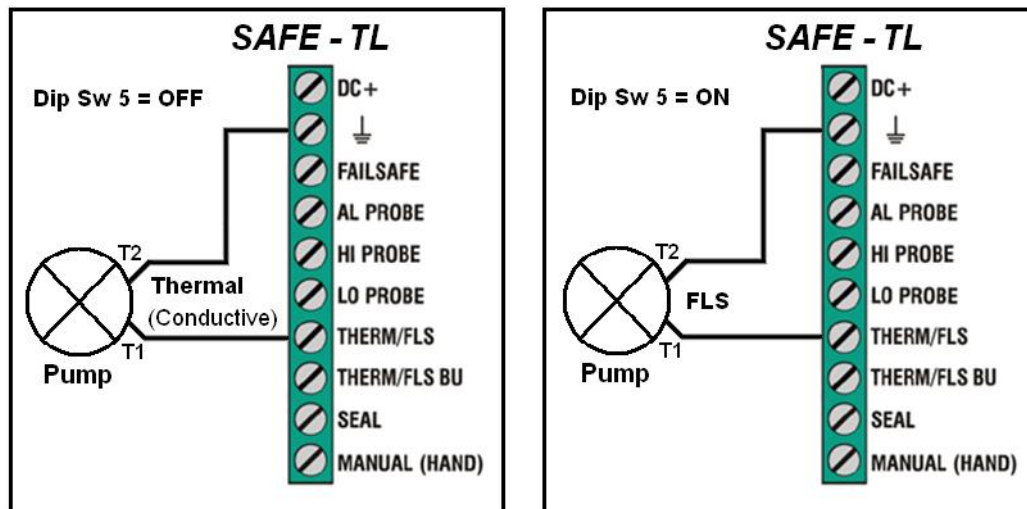


Figure 4 - Thermal Sensor Connections

8.3 Dual Monitoring of Pump Faults

It is possible to connect the TL-Controller and a second device such as the existing pump controller so that both devices monitor and report on a pump fault.

The FLS or thermal and seal sensors are connected to the TL-Controller and the Pump Ok output (DO3) is connected to a digital input on the pump controller.

When a thermal or seal fault occurs, the TL-Controller and the pump controller (if configured) displays a fault and takes appropriate action such as stopping the pump.

If the seal fault is enabled (Dip Sw 4 = Off), then either a thermal or seal fault may have occurred so the pump controller will not be able to determine the type of fault. If a conductive seal sensor is used this can be wired directly into the pump controller (rather than the TL-Controller) to positively identify the pump fault.

If necessary a similar approach can be used on the Level Alarm/Probe Fault output (DO1) – this can be connected to a digital input on the pump controller.

8.4 Local or Remote Monitoring of Pump Status & Faults

The TL-Controller's digital outputs can be wired into the inputs of a wide range of devices (e.g. a PLC, RTU or Dialler etc.) and the state of the pump monitored. The six valid states are tabled below. Recall that DO3 (Pump Ok) is normally closed.

SafeSmart-TL Outputs			
DO1	DO2	DO3	Pump Status
0	1	1	Pump Running
1	1	1	Pump Running & Level Alarm or Probe Fault
0	0	1	Pump Not Running
0	0	0	Pump Not Running & Pump Fault
1	0	1	Pump Not Running & Level Alarm or Probe Fault
1	0	0	Pump Not Running, Pump fault & Level Alarm or Probe Fault

Table 3 – Valid SafeSmart-TL Output States

8.5 MultiSmart and TL Controller Monitoring Pump Faults

This section covers using the TL-Controller in conjunction with a MultiSmart Pump Station Manager.

The MultiSmart is indirectly connected to the thermal sensor via a relay within the TL-Controller. The Controller monitors this line and if it detects that the MultiSmart is no longer connected, the internal relay switches over and the Controller drives the sensor. This dual drive capability only applies to the Thermal/FLS input, and not to the conductive Seal input.

8.5.1 MultiSmart Connections - Conductive Thermal & Seal Sensors

The conductive thermal sensor is connected to the Therm/FLS input and the Therm/FLS BU (backup) is connected to a digital input on the MultiSmart (configured as a Motor OverTemp fault).

The seal sensor is connected to a second digital input on the MultiSmart (configured as a Seal fault). See Figure 5 below.

When a thermal fault is detected, the pump stops, if running - shut down by the MultiSmart and/or the TL-Controller. A Motor OverTemp fault is displayed on the MultiSmart and a thermal fault is displayed on the Controller. The pump can not be restarted until the thermal fault clears. Resetting the fault at the TL-Controller allows the pump to run from the Controller only, the fault must also be reset at the MultiSmart before the MultiSmart is able to run the pump again.

When a seal fault is detected, the pump continues to run if the Seal Fault LED Only option has been selected (Dip Sw 4 = on) and the seal fault defaults have not been changed in the MultiSmart. A seal fault is displayed on the MultiSmart and on the Controller.

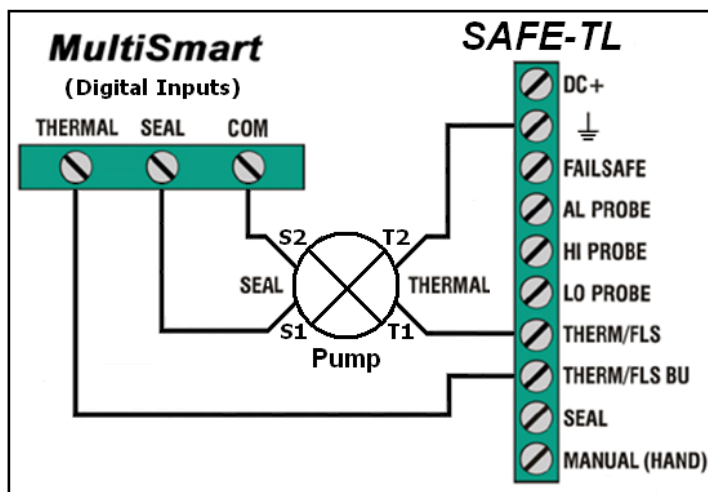


Figure 5 – Connections of Conductive Thermal & Seal Sensors

8.5.2 MultiSmart Connections - FLS (Thermal & Seal) Sensor

The FLS (thermal & seal) sensor is connected to the Therm/FLS input and the Therm/FLS BU is connected to a digital input on the MultiSmart (configured as an FLS fault). See Figure 6 below.

When an FLS thermal fault is detected, the pump stops, if running - shut down by the MultiSmart and/or the TL-Controller. An FLS Flygt Thermal fault is displayed on the MultiSmart and on the Controller. The pump can not be restarted until the thermal fault clears. Resetting the fault at the TL-Controller allows the pump to run from the Controller only, the fault must also be reset at the MultiSmart before the MultiSmart is able to run the pump.

When an FLS seal fault is detected the pump continues to run if the Seal Fault LED Only option has been selected (Dip Sw 4 = on) and the seal fault defaults have not been changed in the MultiSmart. An FLS Flygt Seal fault is displayed on the MultiSmart and on the TL-Controller.

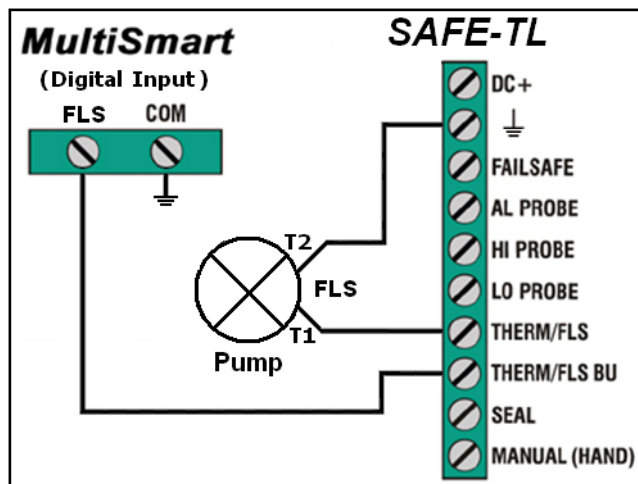


Figure 6 - FLS Connections

8.6 Thermal Fault Reset Options

The TL-Controller can be configured to return to normal operation after a thermal fault has occurred (and is no longer present), in one of two ways. A thermal fault can be reset either manually or automatically. Dip Switch 6 determines the method. With either selection, a manual acknowledgement is still required to clear the Thermal LED.

- Manual (Hand) Thermal Reset - Dip Switch 6 = OFF**
 A manual reset (and acknowledgement) is performed by momentarily connecting Ground to the Manual (Hand) input. See Figure 7 below.
 (Note, the pushbutton switch is not supplied).
- Auto Thermal Reset - Dip Switch 6 = ON**
 A thermal fault is automatically reset when the pump returns to normal operating temperature. (The flashing Thermal LED becomes steady).

A manual acknowledgement is required to clear the LED. (Momentarily connecting Ground to the Manual (Hand) input).

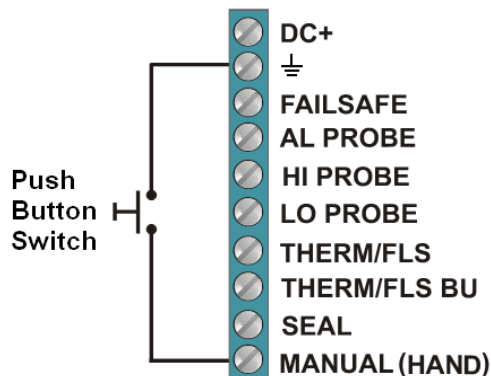


Figure 7 - Manual Thermal Fault Reset & Manual (Hand) Operation

The operation of the Thermal LED varies depending on the state of Dip Switch 6. A manual acknowledgement and/or reset is required to clear (turn off) the Thermal LED.

Manual Thermal Reset (Dip Sw 6 = Off)	Thermal LED	Auto Thermal Reset (Dip Sw 6 = On)	Thermal LED
Thermal fault active	Flashing	Thermal fault active	Flashing
↓		↓	
Motor returns to norm temp	Flashing	Motor returns to norm temp (Pump is free to run)	Steady
↓		↓	
Manual reset & ack required (Pump is free to run & LED cleared)	Off	Manual ack required (LED cleared)	Off

Table 4 - Thermal LED States

9 Manual (Hand) Operation

A pushbutton switch (not supplied) may be connected to the Manual (Hand) input and used to operate the pump directly. (This also resets a thermal fault – see Section 8.6 and Figure 7 above).

Pumping action depends on the liquid level at the time the pushbutton is pressed. If the liquid level is between the activation and deactivation points, briefly pressing the pushbutton causes the pump to operate until the deactivation point is reached. If the liquid level is past the deactivation level, then the pump only operates while the pushbutton is on; as soon as the button is released the pump stops.

10 Pump & Alarm Activation Delays

Activation delays are used to prevent spurious pump starts and level alarms. The delay allows the level device to positively detect the liquid before operating the pump or an alarm.

There are two delay periods:

- 0.5 sec - Dip Switch 3 = OFF
- 10 sec - Dip Switch 3 = ON

This delay applies to both the pump activation delay and the level alarm activation delay.

11 Probe Sensitivity

The TL-Controller is typically used in conjunction with a conductive level sensing device, such as the MultiTrode probe. Conductive probes rely on conductivity through the liquid to earth in order to detect level. Highly conductive liquids such as saltwater, generally require the Controller be set to a lower sensitivity than for low conductive liquids such as distilled water.

For most applications the default sensitivity of 20k ohms is satisfactory. The sensitivity can be adjusted for specific applications – see table 5. It is set using Dip Switches 7 & 8.

Dip Sw 7	Dip Sw 8	Sensitivity	Typical Application
OFF	OFF	1k ohm	Concentrates Acids, Minerals, Alkalis
ON	OFF	4k ohm	Acids, Alkalis, Diluted Brine, Sea Water
OFF	ON	20k ohm	Sullage, Sewage Effluent, Town Water
ON	ON	80k ohm	Industrial Effluent, Purified Water*

Table 5 - Probe Sensitivity

* Not recommended for use with purified de-ionised water or pristine rain water.

12 LED Status Summary

Five LEDs on the front of the Controller indicate the power, fault and alarm status of the Controller. The various states of each LED are listed in table 6.

LED	Status	Indication
Power	Power on	Steady
	Low voltage	Flashing
Level	Level alarm	Flashing - 1Hz
	Assumed probe fault	Flashing - Single Pulse, 3s off
	Failsafe probe fault	Flashing - Double Pulse, 3s off
Pump	Pump on	Steady
	Activation delay period	Flashing
Thermal	Manual ack required	Steady (If Dip Sw 6 = On)
	Thermal fault active <u>or</u> Manual ack required	Flashing (If Dip Sw 6 = Off)
	Standalone Locked Mode*	Flashing - Double Pulse, 3s off
Seal	Seal fault active	Flashing

Table 6 - LED Summary Status

* In Standalone Locked mode the TL Controller ignores the THERM/FLS BU input. Standalone Locked mode occurs if the voltage on the THERM/FLS BU input is unstable (i.e. voltage is < 0.15V and > 6V in less than 0.5s for 30 seconds). To exit Standalone Locked mode, press the Manual (Hand) button.

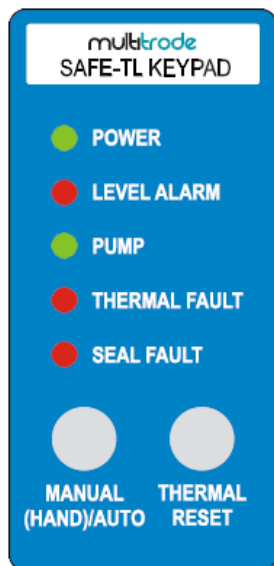
13 DIP Switch Settings

The TL-Controller is configured using the DIP switches located on the front of the enclosure.

DIP #	Setting	Mode Description	Section
1	OFF	Empty (Discharge) Mode	6.1
	ON	Fill (Charge) Mode	6.2
2	OFF	High Level Alarm	6
	ON	Low Level Alarm	6
3	OFF	0.5 sec Pump & Alarm Activation Delay	10
	ON	10 sec Pump & Alarm Activation Delay	10
4	OFF	Seal Fault Operates DO3	8.1
	ON	Seal Fault LED Only	8.1
5	OFF	Thermal	8.2
	ON	Thermal / FLS	8.2
6	OFF	Manual (Hand) Thermal Reset	8.6
	ON	Auto Thermal Reset	8.6
7	8	Probe Sensitivity	11
OFF	OFF	1k ohm	
ON	OFF	4k ohm	
OFF	ON	20k ohm	
ON	ON	80k ohm	

Table 7 - Dip Switch Settings

14 Optional Mimic Panel (Keypad)



The TL-Controller can be supplied with an optional Mimic Panel (or keypad) for remote indication. The panel has the same LED indicators as the Controller. A pushbutton for remote Manual (Hand) operation of the pump, and a second pushbutton to reset a Thermal fault.

The Mimic Panel is connected to the Controller by a four wire cable. The terminal is located on the bottom of the enclosure. One pair supply power to the Mimic panel and the second pair provide an RS485 serial communications link (see Figure 9).

Figure 8 - Mimic Panel

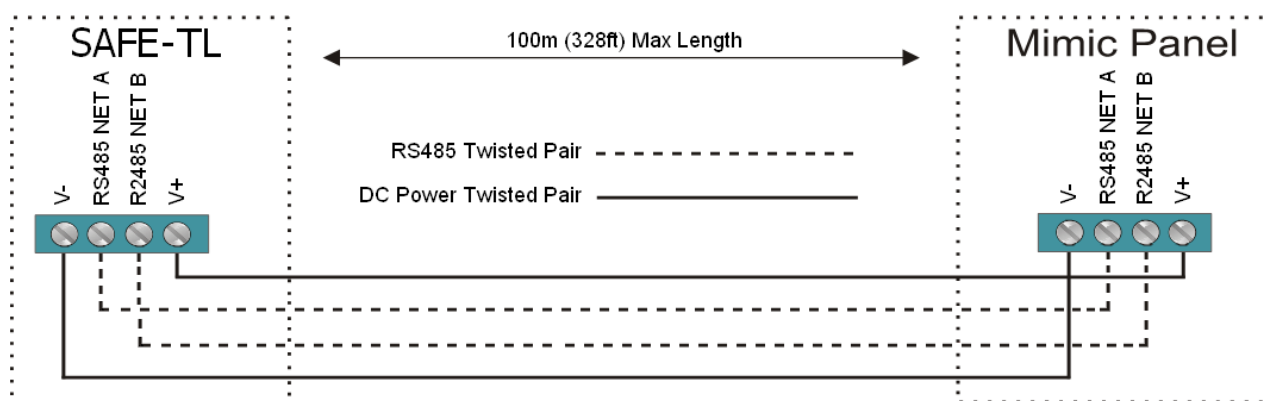


Figure 9 - Mimic Panel Comms Cable Connections

Dimensions	
Width	40mm (1 9/16")
Height	80mm (3 1/8")
Depth	15mm (5/8")
Environmental	
Ambient Temperature	-10 to 60 °C (14 to 140 °F)
Humidity	5% to 90% non-condensing
DC Power Supply	
Voltage Range	12 – 30V DC (Supplied via interface to SafeSmart-TL)
Current	0.05A max

Table 8 - Mimic Panel Specifications

15 Example Applications

15.1 Backup Application

Following is an example of an empty (discharge) application using the TL-Controller as backup to a pump controller (the primary control device). The TL-Controller takes no action until the high level probe is covered. When the high level probe is covered, the Pump Control output (DO2) closes turning on the pump.

If the level continues to rise and it reaches the Alarm probe, a high level alarm is tripped. This indicates that the pump (for whatever reason) is unable to cope and the level has risen to an extremely high level (and overflow is possibly imminent).

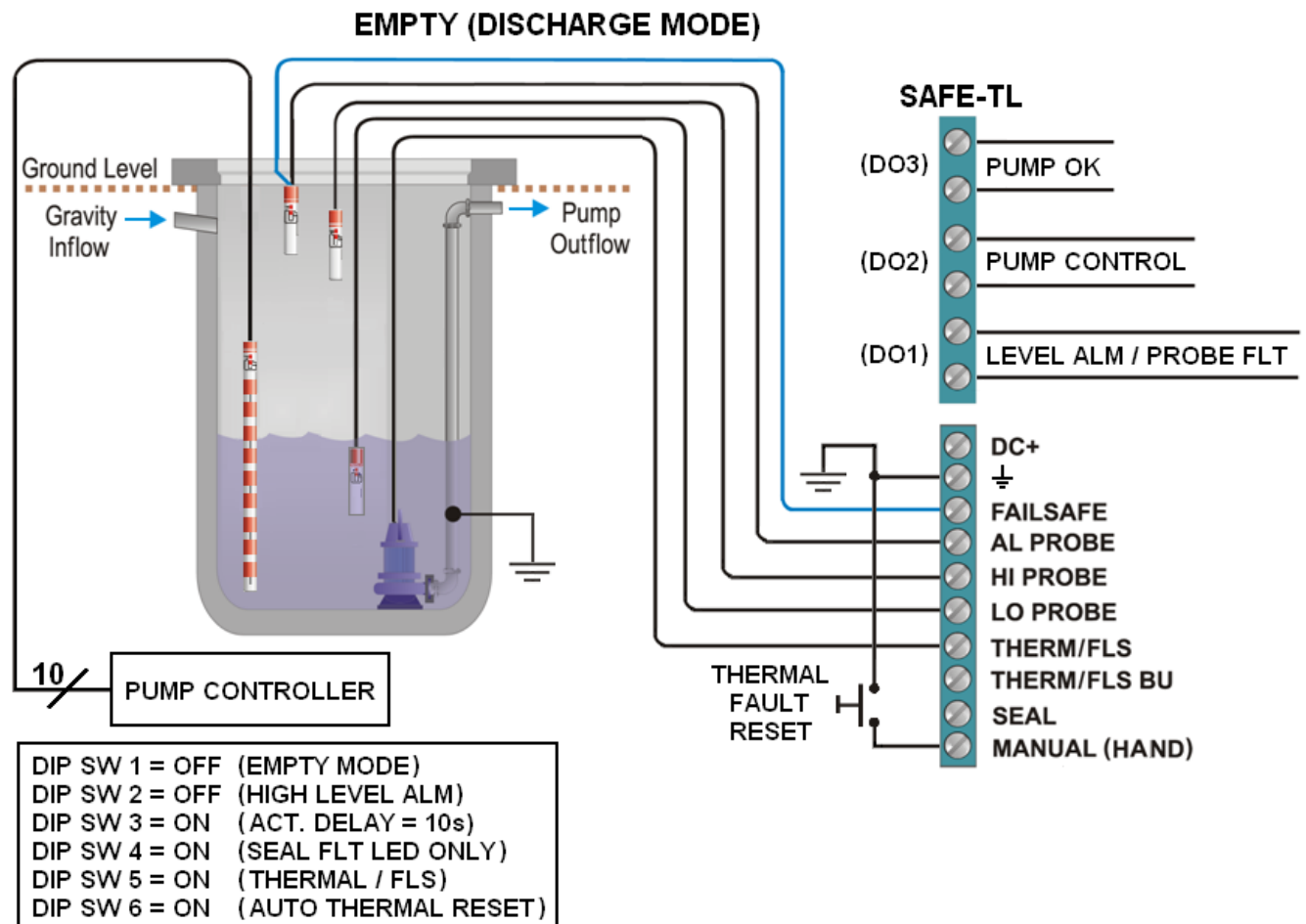


Figure 10 - Example of a Backup Application

If the pump controller is located at a site with no telemetry, a low level alarm could be configured (rather than a high level alarm). If the alarm trips, it indicates (by means of say a beacon) that the primary pump controller has most likely failed. However no further alarm would be generated by the TL-Controller to indicate an extremely high level has been reached.



NOTE:

The actual probe positions in a well is at the discretion of the end user, the only requirement for a discharge (empty) application is that the high probe must be positioned higher than the (highest*) activation setpoint. (* In some pump controllers, more then one activation setpoint may be defined).

15.2 Dual Thermal Fault Monitoring (with a Generic Pump Controller)

The following wiring diagram (Figure 11), illustrates an application where the TL-Controller operates in parallel with a second device, a typical pump controller or PLC.

The thermal sensor is connected to the TL-Controller and the Pump Ok output from the TL-Controller is connected to the pump controller allowing both devices to act on a thermal fault. When the Pump Ok output (DO3) (which is normally closed) opens, it indicates either a thermal pump fault is present or the TL-Controller has lost power.

The conductive seal sensor can be connected to either the pump controller or the TL-Controller. If connected to the pump controller a seal fault must be assigned to the appropriate digital input on the pump controller. Connecting it to the pump controller allows the pump controller to distinguish between a seal and thermal pump fault and if telemetry is used this fault information can be passed back to the control station.

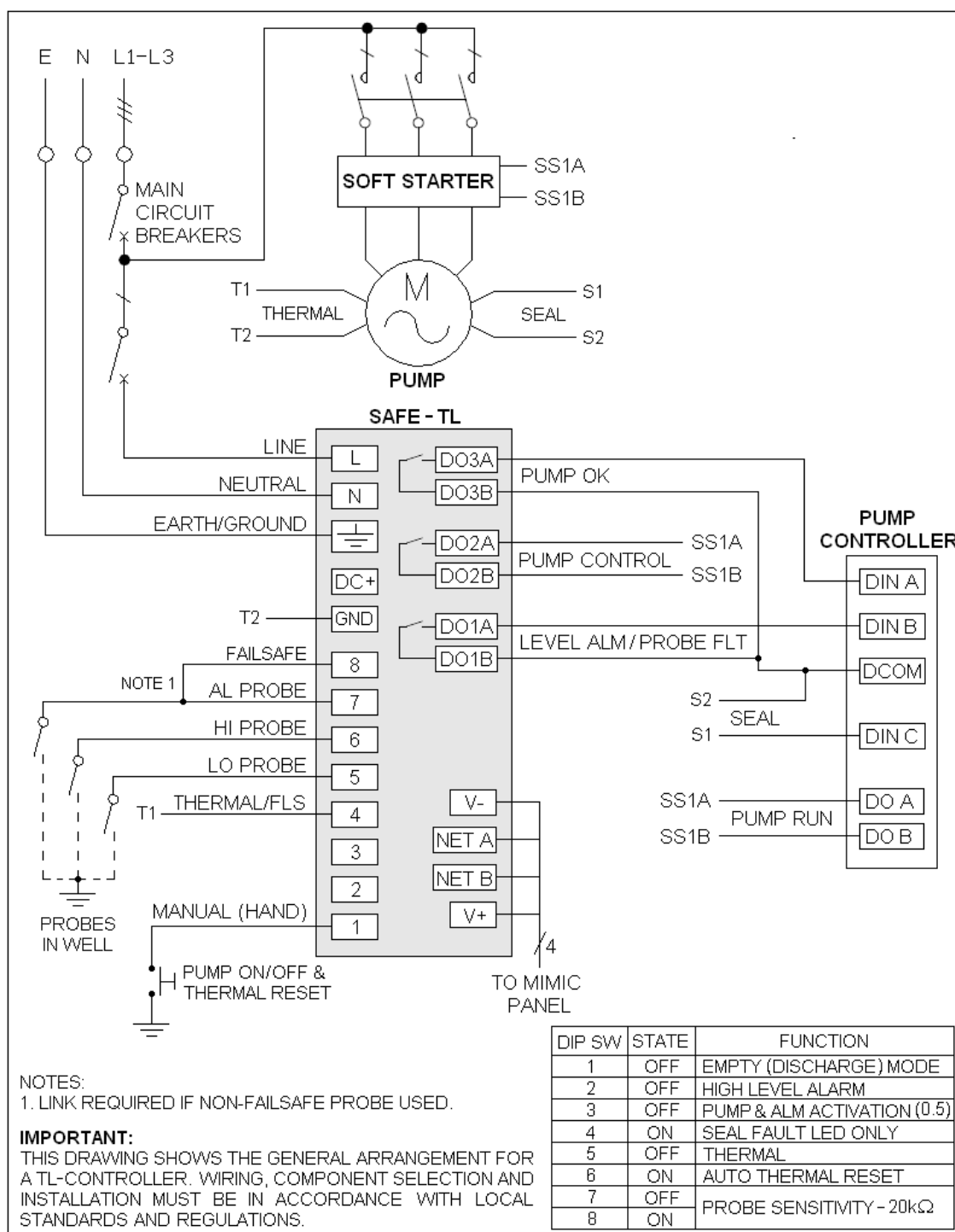


Figure 11 – Dual Mode Operation of the SafeSmart-TL Controller (Generic Pump Controller)

15.3 Dual Thermal Fault Monitoring (with a MultiSmart)

The following wiring diagram (Figure 12), illustrates an application where the TL-Controller and the MultiSmart both monitor the thermal sensor.

The thermal sensor is connected to the TL-Controller and the Thermal / FLS Backup input is connected to the MultiSmart allowing both devices to act on a thermal fault. The backup input has two functions, it indicates to the TL-Controller if a MultiSmart is connected and passes the thermal sensor signal onto the MultiSmart.

For a non-FLS thermal sensor a **Pump x Motor Over Temp** fault must be assigned to the digital input that the "Therm / FLS BU" input is connected to. So when a pump thermal fault is detected, a **Pump x Motor Over Temp** fault will be displayed on the MultiSmart and the Thermal LED will flash on the TL-Controller.

While not illustrated, for an FLS sensor (DIP SW 5 = On) a **Pump x FLS** fault must be assigned to the digital input that the "Therm / FLS BU" input is connected to. So depending on the fault detected either a **Pump x FLS Flygt Thermal** fault or a **Pump x FLS Flygt Seal Fault** will be displayed on the MultiSmart and the Thermal or Seal LED will flash on the TL-Controller.

The conductive seal sensor can be connected to the TL-Controller or the MultiSmart. A **Pump x Seal** fault must be assigned to the appropriate digital input. If connected to the MultiSmart it allows the primary pump controller (the MultiSmart) to act on the fault and if telemetry is used, this fault information can be passed back to the control station.

A General (or custom) fault can be configured on the MultiSmart to monitor the Pump Ok output (DO3) on the TL-Controller. If this output (which is normally closed) opens when a thermal fault is not present it may indicate that the TL-Controller has lost power.

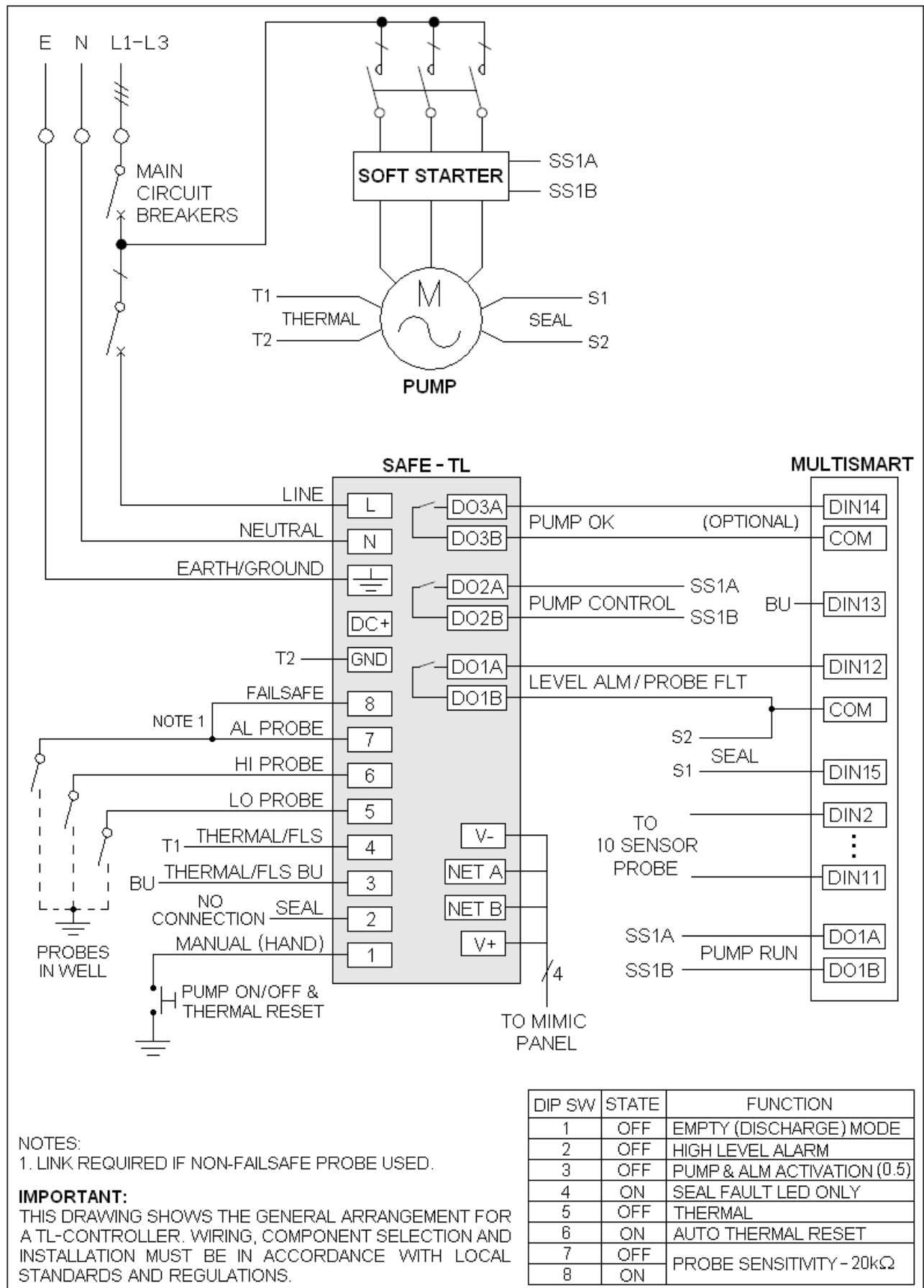


Figure 12 – Dual Thermal Fault Monitoring (with a MultiSmart)

15.4 Simplex Pump Controller

In this example the TL-Controller is configured as the pump controller for a single Flygt pump. The TL-Controller takes no action until the high level probe is covered. When the high level probe is covered, the Pump Control output (DO2) closes turning on the pump.

When the Alarm Level probe is covered, a high level alarm is generated (DO1 closes). The TL-Controller monitors the FLS sensor for thermal and seal faults. The wiring is illustrated in Figure 13 below.

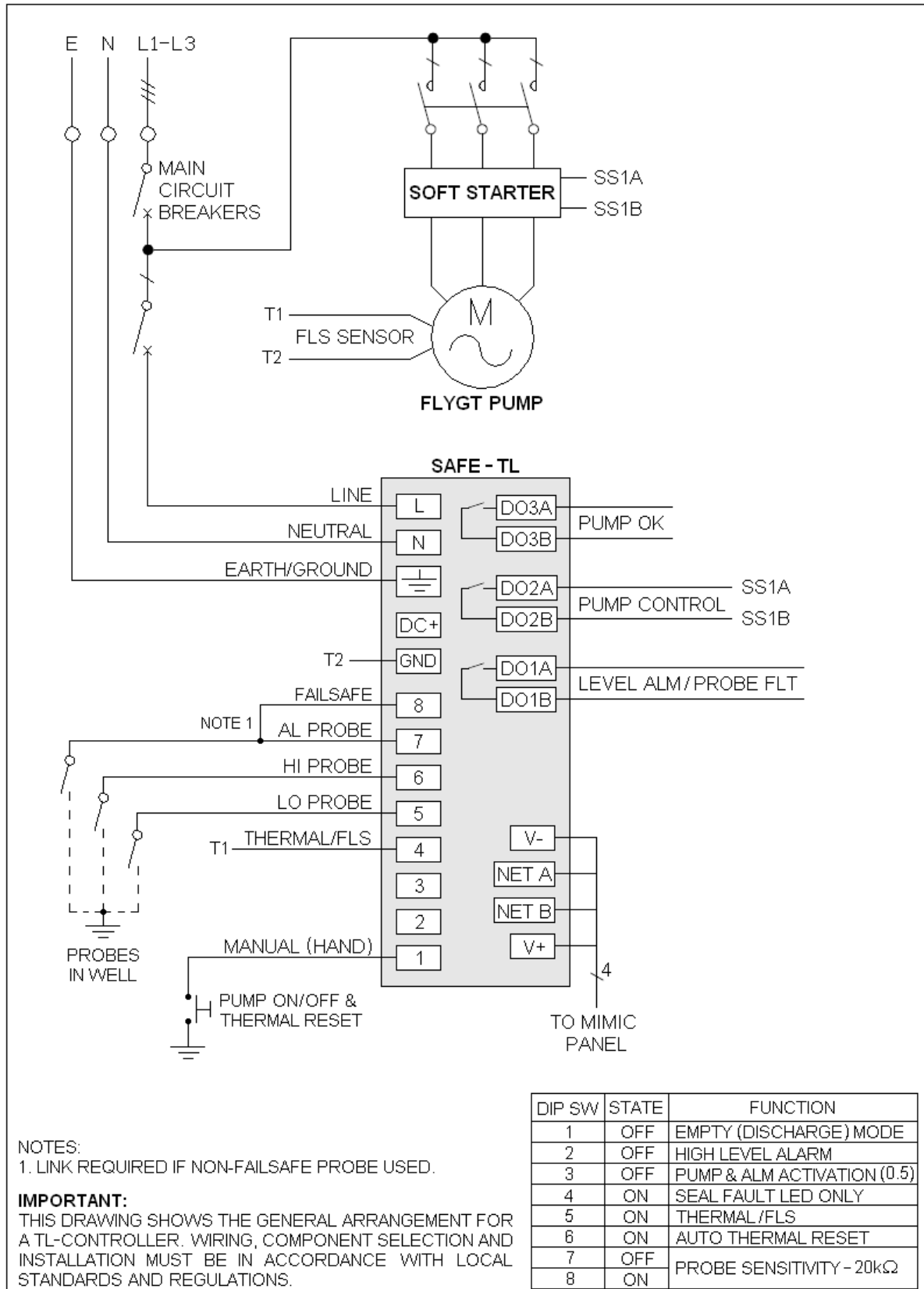


Figure 13 Simplex Pump Controller

16 SafeSmart-TL Label

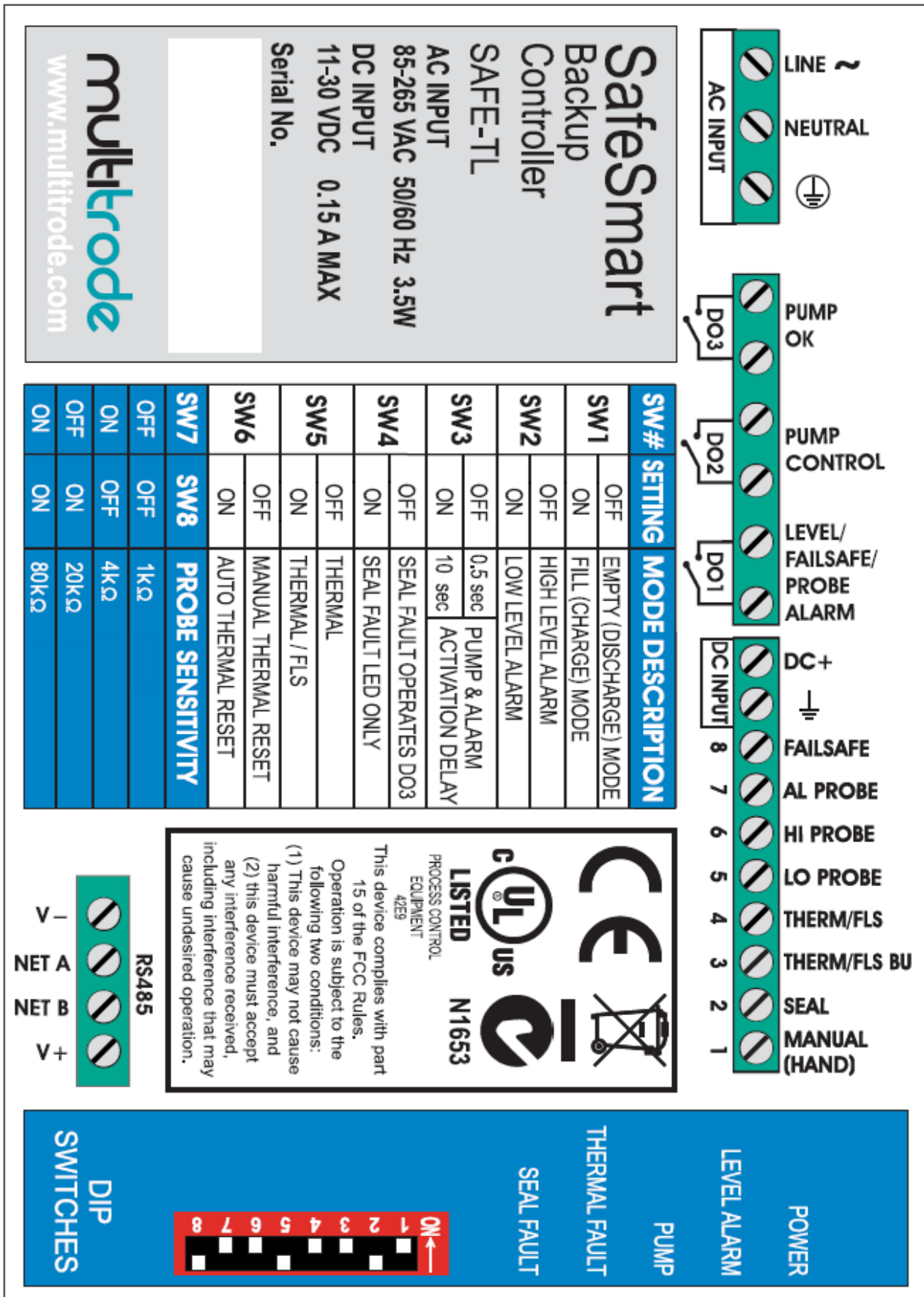


Figure 14 – SafeSmart-TL Label.



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