multitrode

WATER • WASTEWATER • PUMP STATION • TECHNOLOGY

SAFESMART
Backup Controller
SAFE-FSP

Installation & Operation Manual

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

Document No. 00242600

Document Revision 3

Last updated 10 August 2013

NOTICE

.

Contents

Table of Figures

Summary of Tables

1 Warnings and 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–FSP 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-FSP installation and wiring must be performed by qualified personnel.

DANGER:
The SafeSmart-FSP 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 SAFE-FSP 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 MultiTrode probe.

The FSP 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 an FSP Controller as a backup controller, it only controls the pump in response to high or low level signals from dedicated level sensors.

A thermal sensor can be connected to the FSP Controller for pump protection. During operation, the LED indicators on the front panel displays the current status including – Power, Pump On/Off, Level alarm, Thermal fault and Probe fault.

The FSP Backup 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 ¾”)
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*	
Thermal Fault Present	> 4k ohms
Thermal Fault Cleared	< 2k ohms
Thermal BU Input	0.15V DC

Table 1 – SAFE-FSP 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 FSP 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 features of the Controller are listed below and are discussed in the following sections.

- Power Supply Options
  - Four Configurations
- Operation Modes & Probe Inputs
  - Empty (Discharge) Mode
  - Fill (Charge) Mode
- Level Alarm Fault
  - Level Alarm (AL Probe)
- Pump Faults
  - Thermal Pump Fault
- Probe Faults
  - Failsafe Probe Fault
  - Assumed Probe Fault
- Digital Output and Pump Sensor Connection Options
  - Local or Remote Monitoring of Pump Status & Faults
  - MultiSmart Connections - Conductive Thermal Sensor
  - MultiSmart Connections - FLS Thermal Sensor
- Manual (Hand) Operation
- Alarm Activation and Deactivation Delays
- Probe Sensitivity
- LED Status Summary
- DIP Switch Settings

5 Power Supply Options

The FSP 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 be 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 below.

Unit Supply Range	Recommended Switch/Circuit-Breaker/Overcurrent 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 MultiTrode probe uses an earth/ground return path for the signal. Ensure that the GROUND (DC-) terminal on the FSP Controller is also grounded.

6 Operation Modes and Probe Inputs

The SafeSmart-FSP 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, High, Low 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 (see Figure 1). In this mode the Controller operates as follows:

- The pump activates when the liquid reaches the sensor in 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.
- When a thermal fault occurs, the Pump Control output is deactivated regardless of the liquid level. The pump stops, the Pump Fault output (DO1) is deactivated and the Thermal LED flashes.

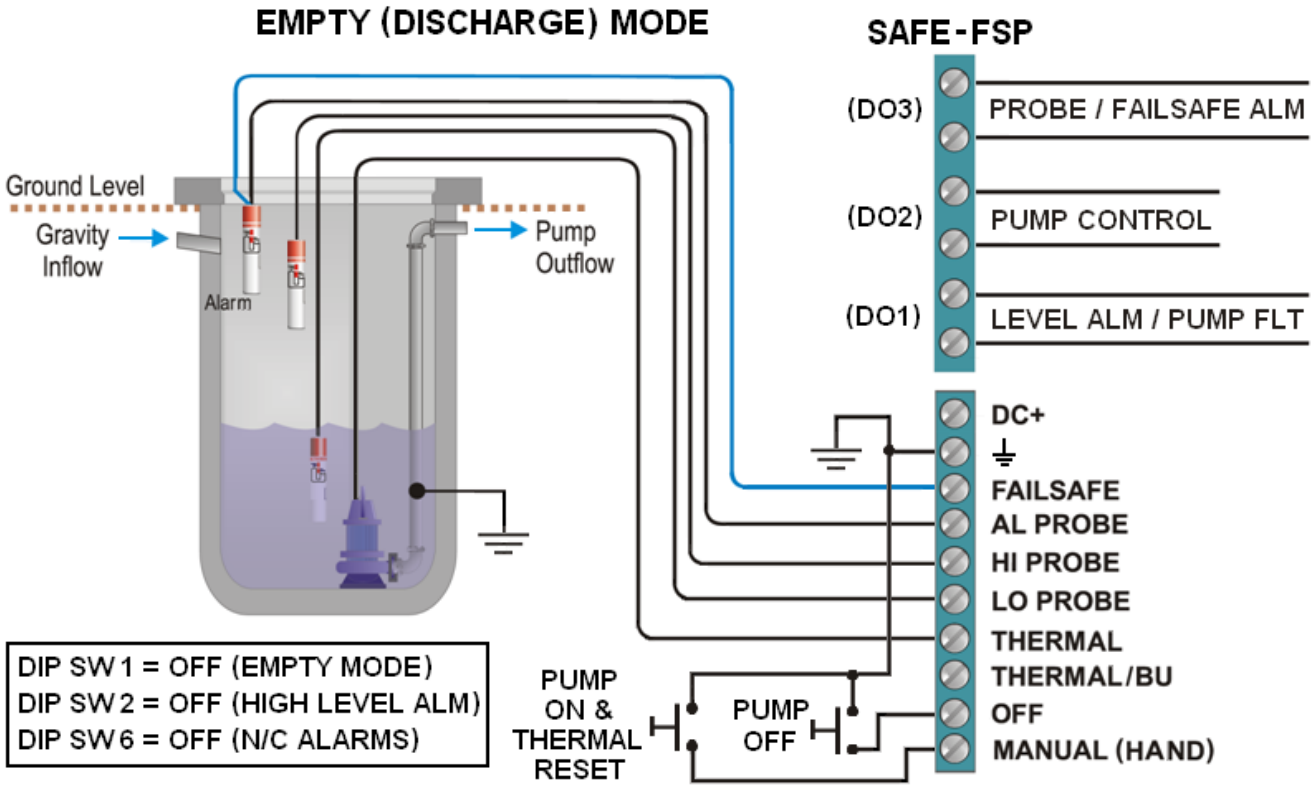


Figure 1 – Empty (Discharge) Mode

6.2 Fill (Charge) Mode

This mode is used to fill up a well with liquid when the level falls to a preset level (see Figure 2). In this mode the Controller operates as follows:

- The pump activates when the liquid falls just below the sensor in the low level probe.
- The pump continues to operate until the liquid level reaches the sensor in the high level probe and the pump deactivation period expires.
- When a thermal fault occurs the Pump Control output deactivates regardless of the liquid level. The pump stops, the Pump Fault output changes state and the Thermal LED flashes.

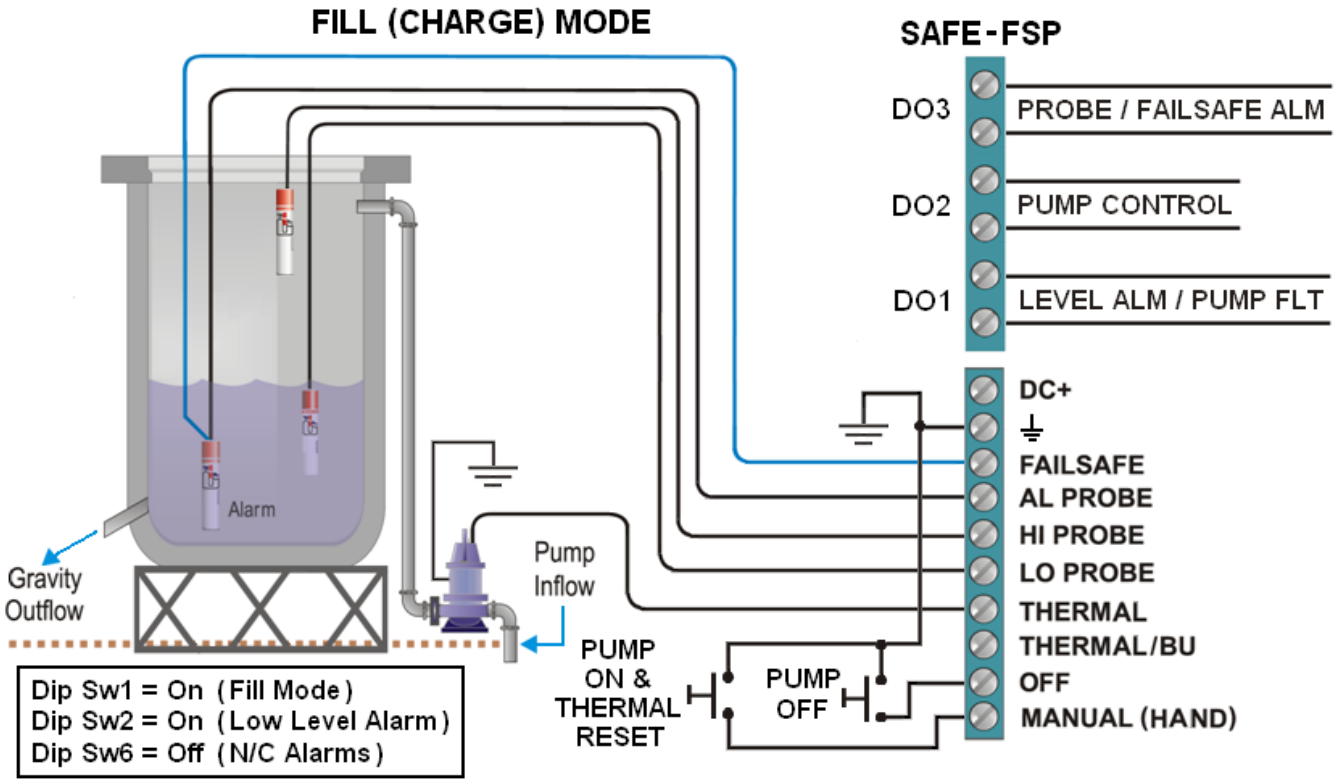


Figure 2 – Fill (Charge) Mode

7 Level Alarms (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) changes state and the Level Alarm LED flashes at 1Hz. The Level Alarm/Pump Fault output can be used to operate an alarm device such as a beacon.

The Level Alarm/Pump Fault output (DO1) can be configured as normally open or normally closed.

- Normally Closed Output - Dip Switch 6 = OFF
- Normally Open Output - Dip Switch 6 = ON

NOTE:
Dip Sw6 also has the same effect on the Probe/Failsafe Alarm output (DO3).

8 Thermal Pump Fault

The FSP Controller can detect thermal and FLS thermal faults. The FSP Controller can not detect a Seal fault. Types of sensors that maybe connected are FLS (Flygt Leakage Sensor), FLS10 or a thermal only sensor such as non-linear PTC thermistor or bi-metallic switch.

A thermal sensor is connected as illustrated in Figure 3. No Dip Switch setting change is required.

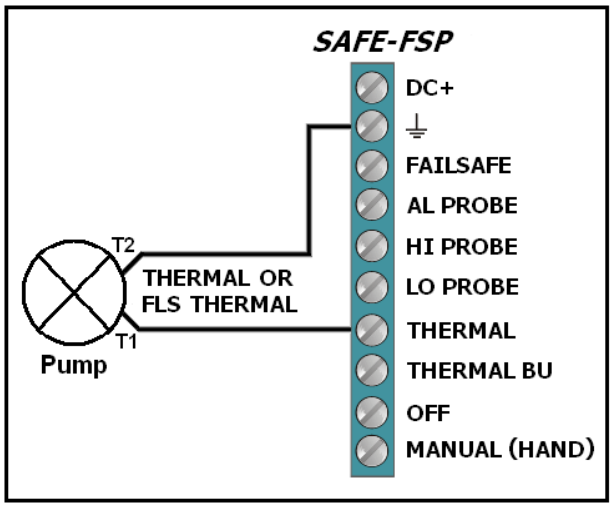


Figure 3 – Thermal Sensor Connection (Flygt and Non-Flygt Pumps)

When a thermal fault is detected, the pump stops, (DO2 is deactivated), the Level Alarm / Pump Fault output (DO1) changes state and the Thermal Fault LED begins to flash.

A thermal fault is automatically reset when the pump returns to normal operating temperature (i.e. the fault is no longer present). The flashing Thermal LED becomes steady and the pump is free to run.

A manual acknowledgement is required to clear the Thermal LED. A manual acknowledgement is performed by momentarily connecting Ground/Earth to the Manual (Hand) terminal. See Figure 4 below. (Note, the pushbutton switch is not supplied).

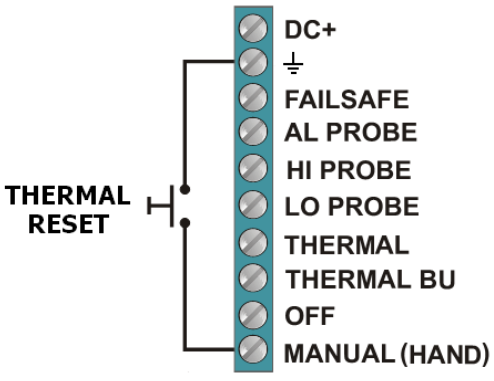


Figure 4 – Manual Thermal Fault Reset & Manual (Hand) Operation

The Level Alarm/Pump Fault output (DO1) can be configured as normally open or normally closed.

- Normally Closed Output - Dip Switch 6 = OFF
- Normally Open Output - Dip Switch 6 = ON

NOTE:
Dip Sw 6 also has the same effect on the Probe/Failsafe Alarm output (DO3).

9 Probe Faults

The FSP Controller detects two types of probe faults, a Failsafe Probe fault and an Assumed Probe fault. When either fault is detected the Probe/Failsafe Alarm output (DO3) changes state. This output can be configured as normally open or normally closed.

- Normally Closed Output - Dip Switch 6 = OFF
- Normally Open Output - Dip Switch 6 = ON

NOTE:
Dip Sw6 also has the same effect on the Level Alarm/Pump Fault output (DO1).

9.1 Failsafe Probe Fault

MultiTrode probes are available with a failsafe connection to the top-most sensor to enable detection of a sensor fault. If a broken cable is detected to the top-most sensor, the Probe/FailSafe fault output (DO3) changes state, the Probe Fault LED flashes and the **pump stops**.

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 inputs to suppress erroneous probe faults.

NOTE:
When using single sensor probes, the Failsafe Probe input should be connected to the highest probe in the system.

9.2 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 Probe Fault LED illuminates.

The Controller changes its pumping behaviour to a timed method until the fault condition is no longer present. So the pump continues to run for 60s 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 Probe Fault LED illuminates.

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.

When an Assumed Probe fault occurs, the Probe/FailSafe fault output (DO3) changes state.

10 Digital Output and Pump Sensor Connection Options

10.1 Local or Remote Monitoring of Pump Status & Faults

The FSP 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 valid states and what they signify are tabled below.

FSP Outputs*			Level Alarm or Thermal Fault	Pump Status	As\Probe Flt or Failsafe Fault
DO1	DO2	DO3	DO1	DO2	DO3
0	0	0	-	Off	-
0	0	1	-	Off	Y
1	0	0	Y	Off	-
1	0	1	Y	Off	Y
0	1	0	-	On	-
0	1	1	-	On	Y
1	1	0	Y	On	-
1	1	1	Y	On	Y

Table 3 – FSP Controller Output States

* Dip Sw 6 = On (Normally Open)

10.2 MultiSmart and FSP Controller Thermal Sensor Options

The FSP Controller can be used in conjunction with a MultiSmart Pump Station Manager.

The MultiSmart is indirectly connected to the thermal sensor via a relay within the FSP Controller. The Controller monitors this line and if it detects that the MultiSmart is no longer connected, the internal relay switches over and the FSP Controller drives the sensor.

The Controller monitors the voltage on the Thermal BU input to the MultiSmart. If the MultiSmart fails, the Controller takes over and controls the pump (but does not inhibit the MultiSmart pump control) and monitors for a thermal fault – thus providing backup control and thermal overload protection to the pump.

10.2.1 MultiSmart Connections - Conductive Thermal Sensor

The conductive thermal sensor is connected to the Thermal input. The Thermal BU (backup) is connected to a digital input on the MultiSmart (configured as a Motor OverTemp fault). See Figure 5 below.

The MultiSmart and FSP controller are both capable of responding to a thermal fault. When a thermal fault is detected, the pump stops, if running. 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. The FSP Controller automatically resets the fault when the fault condition is no longer present, this allows the pump to run again but only via the Controller The fault must be reset at the MultiSmart before the MultiSmart is able to run the pump again.

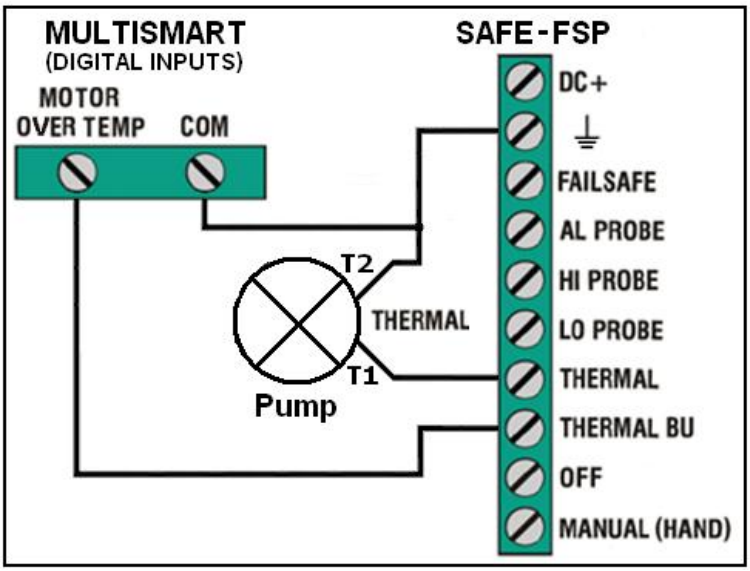


Figure 5 – Thermal Sensor Connections to a MultiSmart

10.2.2 MultiSmart Connections - FLS Thermal Sensor

The FLS sensor is connected to the Thermal input. The Thermal BU is connected to a digital input on the MultiSmart (configured as an FLS fault). (See Figure 6 below). The FSP Controller is not able to detect a seal fault however the MultiSmart can.

When an FLS thermal fault is detected, the pump stops, if running - shut down by the MultiSmart and/or the FSP 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. The FSP Controller automatically resets the fault when the fault condition is no longer present, this allows the pump to run again but only via the Controller The fault must be reset at the MultiSmart before the MultiSmart is able to run the pump again.

When an FLS Seal fault occurs the FSP Controller is unable to detect it however the MultiSmart can and will display an FLS Flygt Seal fault. By default, the MultiSmart allows the pump to continue to run when a seal fault occurs.

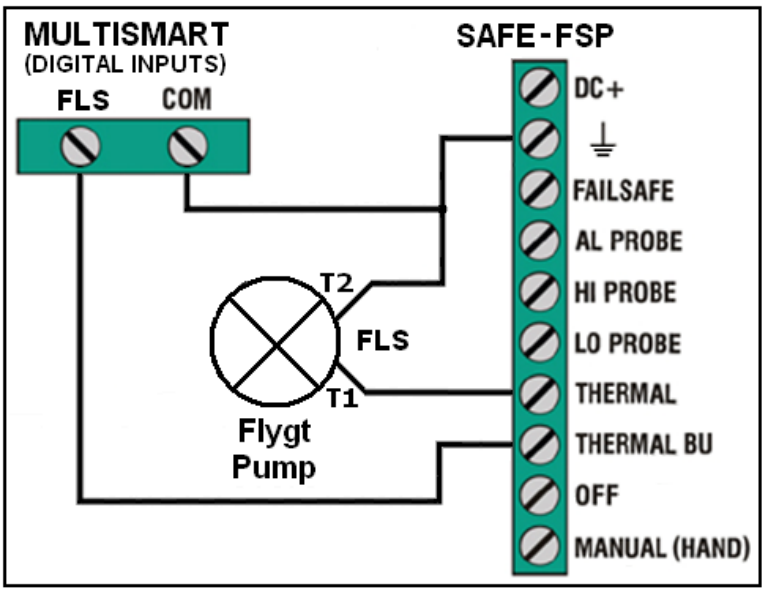


Figure 6 – FLS Connections to a MultiSmart (Flygt Pump)

11 Manual (Hand) Operation

A momentary action pushbutton (not supplied) may be connected to the Manual (Hand) input and used to operate the pump directly. (See Figure 7). Once pressed the pump begins to operate immediately irrespective of the liquid level. A second momentary action pushbutton switch is required to switch the pump off. It is connected across the Off input and Ground/Earth.

WARNING:
If operating the pump manually via the Manual (Hand) switch, the pump does **NOT** automatically turn off when the level falls below the low sensor. So ensure that the pump is switched off via the Pump **Off** switch before the level becomes critically low to avoid potential **damage** to the **pump**.

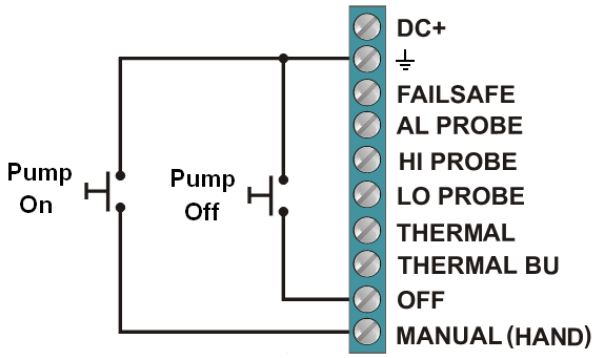


Figure 7 – Manual Pump Operation - On & Off Switches

12 Pump Activation and Deactivation Delays

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

There are two delay periods for Pump Activation delay:

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

There are two delay periods for Pump Deactivation delay:

- 0.5 sec - Dip Switch 4 = OFF
- 30 sec - Dip Switch 4 = ON

13 Alarm Activation and Deactivation Delays

Activation and Deactivation delays are used to prevent spurious level alarms. The delay allows the level device to positively detect the liquid before triggering the alarm.

There are two delay periods:

- 0.5 sec - Dip Switch 5 = OFF
- 10 sec - Dip Switch 5 = ON

This delay applies to both the alarm activation and deactivation delay.

14 Probe Sensitivity

The Controller is 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 conductivity liquids, such as distilled water.

For most applications, the default probe setting of 20k ohms is satisfactory but the Controller allows the operator to adjust its sensitivity as needed for specific conditions. The sensitivity is set using Dip Switches 7 and 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 4 – Probe Sensitivity

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

15 LED Status Summary

Five LEDs on the front of the Controller indicate the power, level alarm, pump status, thermal and probe fault status of the Controller.

LED	Status	Indication
Power	Power on	Steady
	Low voltage	Flashing
Level	Level alarm	Flashing
Pump	Pump on	Steady
	Activation delay period	Flashing
Thermal	Manual ack required	Steady
	Thermal fault active	Flashing
	Standalone locked mode*	Flashing - Double
Probe	Assumed probe fault	Steady
	Failsafe probe fault **	Flashing

Table 5 – LED Summary Status

* In Standalone Locked mode the FSP Controller ignores the THERMAL BU input. Standalone Locked mode occurs if the voltage on the THERMAL 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.

** Failsafe probe fault has higher priority than Assumed probe fault.

16 DIP Switch Settings

The 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	7
	ON	Low Level Alarm	7
3	OFF	0.5 sec Pump Activation Delay	12
	ON	30 sec Pump Activation Delay	12
4	OFF	0.5 sec Pump Deactivation Delay	12
	ON	30 sec Pump Deactivation Delay	12
5	OFF	0.5 sec Alarm Activation &	13
	ON	10 sec Alarm Activation &	13
6	OFF	N/C (Normally Closed) (DO3 & DO1)	7,8,9
	ON	N/O (Normally Open) (DO3 & DO1)	7,8,9
7	**8**	Probe Sensitivity	14
OFF	OFF	1k ohm	
ON	OFF	4k ohm	
OFF	ON	20k ohm	
ON	ON	80k ohm	

Table 6 – Dip Switch Settings

17 Example Applications

17.1 Backup Operation

Following is an example an empty/discharge application (Figure 8) using the FSP Controller as backup to a pump controller (the primary control device). In this configuration the FSP Controller does not control the pump until the High Level probe is covered which should only occur if the pump controller fails.

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 excessively high level (and overflow is possibly imminent).

The Alarm and High Level probes are positioned higher than the highest activation point used by the pump controller.

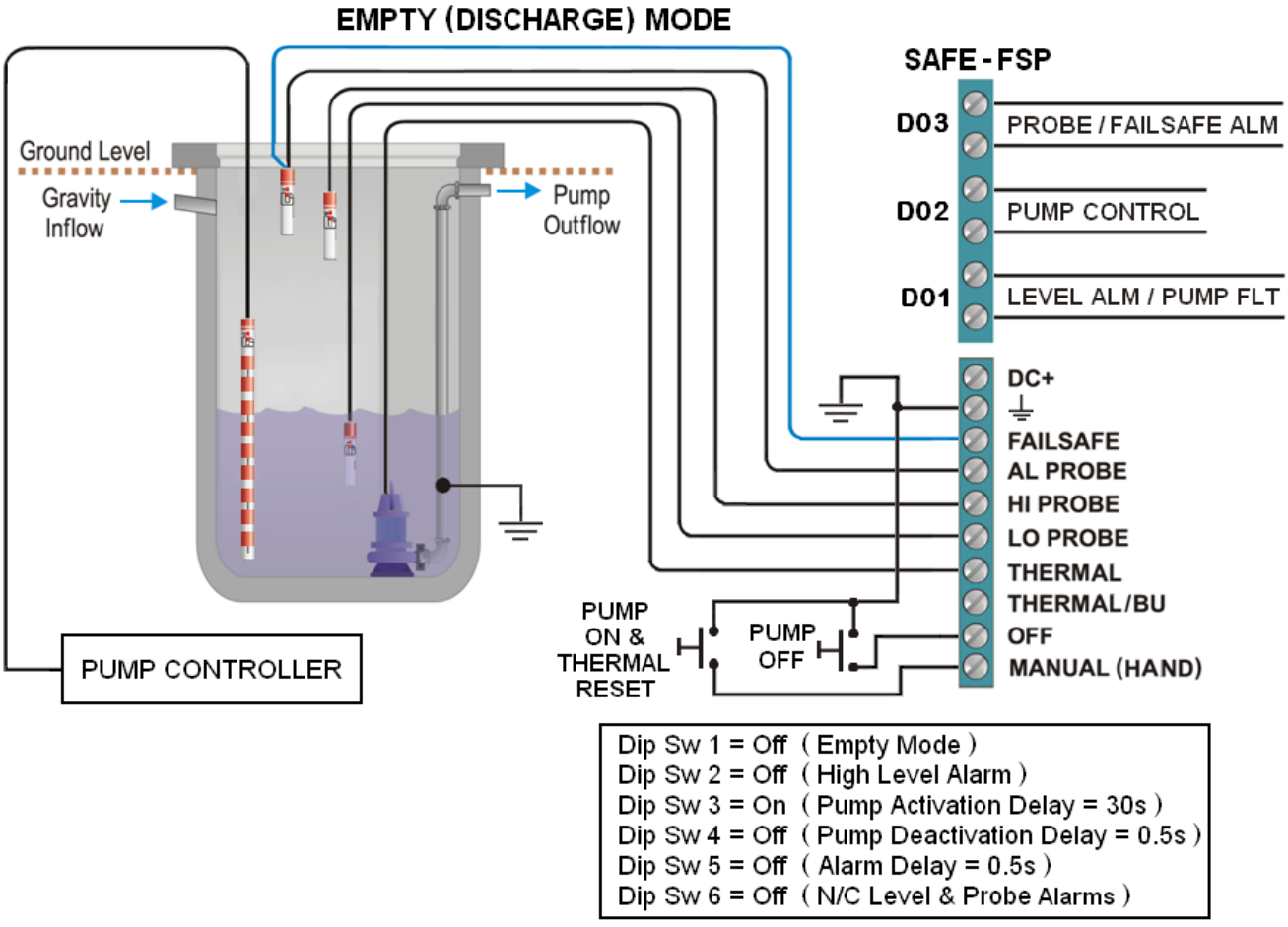


Figure 8 – Example of a Backup Application

A slight variation to the above example maybe applied to applications where the FSP Controller is located at a site with no telemetry, the level alarm output (configured as a high level alarm) could be connected to say an external beacon. So whenever the level alarm becomes active, it provides a clear indication to anyone passing the station that the primary pump controller has most likely failed or at the very least, the station is unable to cope and consequentially the level has risen passed a critical point. (Note, in this case the level alarm probe would be positioned *above* the normal pump controller's activation point and *below* the FSP Controller's activation point).

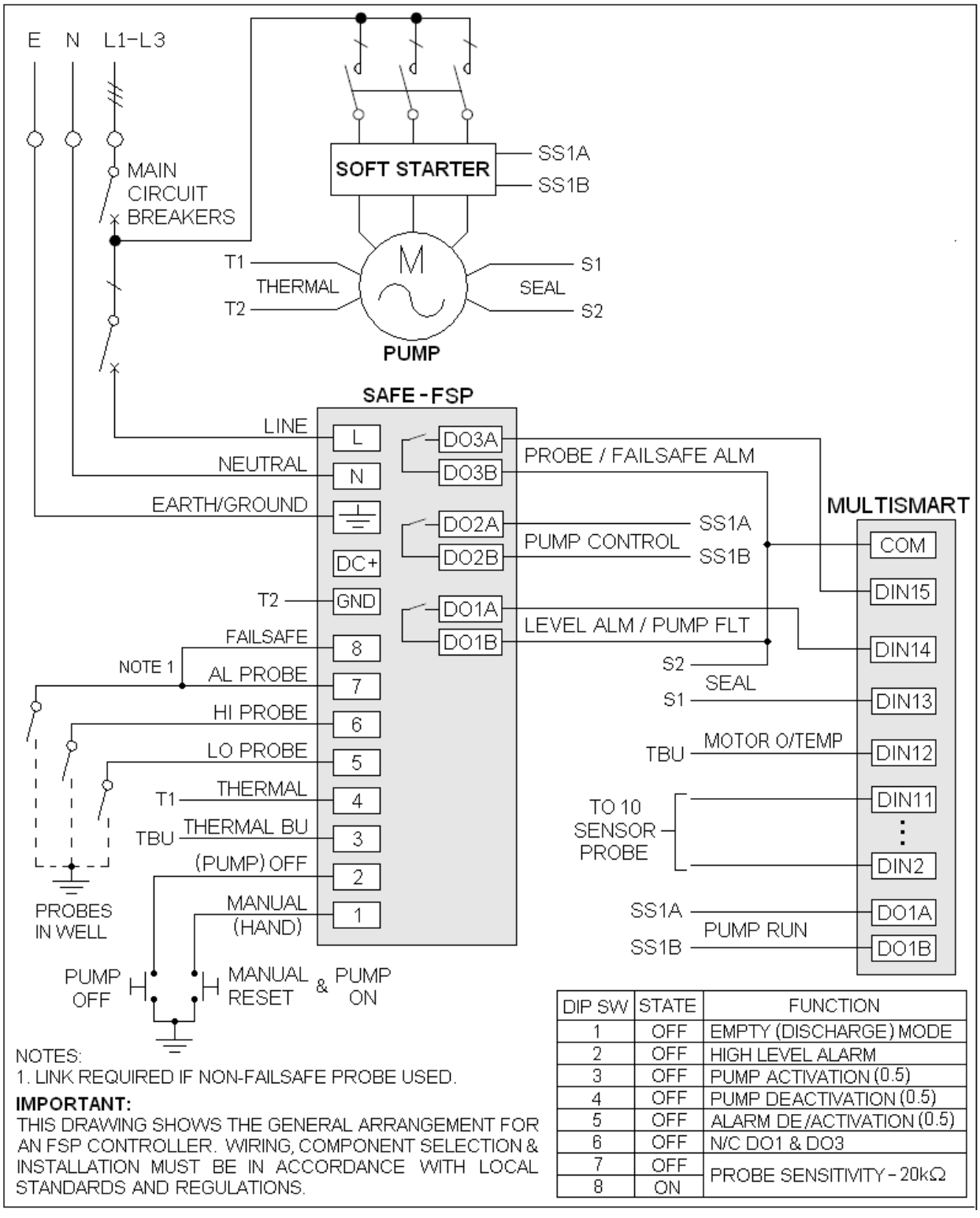
NOTE:
The actual probe position is at the discretion of the end user, the only requirement for a discharge (empty) application is that the high probe must be positioned higher than the (highest*****) activation setpoint. (***** In some pump controllers, more than one activation setpoint may be defined).

17.2 Dual Thermal Fault Monitoring (with MultiSmart)

The following wiring diagram (Figure 9), illustrates an application where the FSP Controller operates as a backup controller and both the FSP and the MultiSmart pump controller monitors for a pump Thermal fault.

The thermal sensor is connected to the FSP Controller and the Thermal Bu input is connected to the MultiSmart. This allows both devices to act on a thermal fault. (If a seal sensor is present, it is connected to the MultiSmart).

The FSP outputs, Level Alarm / Pump Fault (DO1) and Probe / FailSafe Alarm (DO3) are also monitored by the MultiSmart – this is optional.



DIP SW	STATE	FUNCTION
1	OFF	EMPTY (DISCHARGE) MODE
2	OFF	HIGH LEVEL ALARM
3	OFF	PUMP ACTIVATION (0.5)
4	OFF	PUMP DEACTIVATION (0.5)
5	OFF	ALARM DE/ACTIVATION (0.5)
6	OFF	N/C DO1 & DO3
7	OFF	PROBE SENSITIVITY – 20kΩ
8	ON	

Figure 9 – Dual Thermal Fault Monitoring

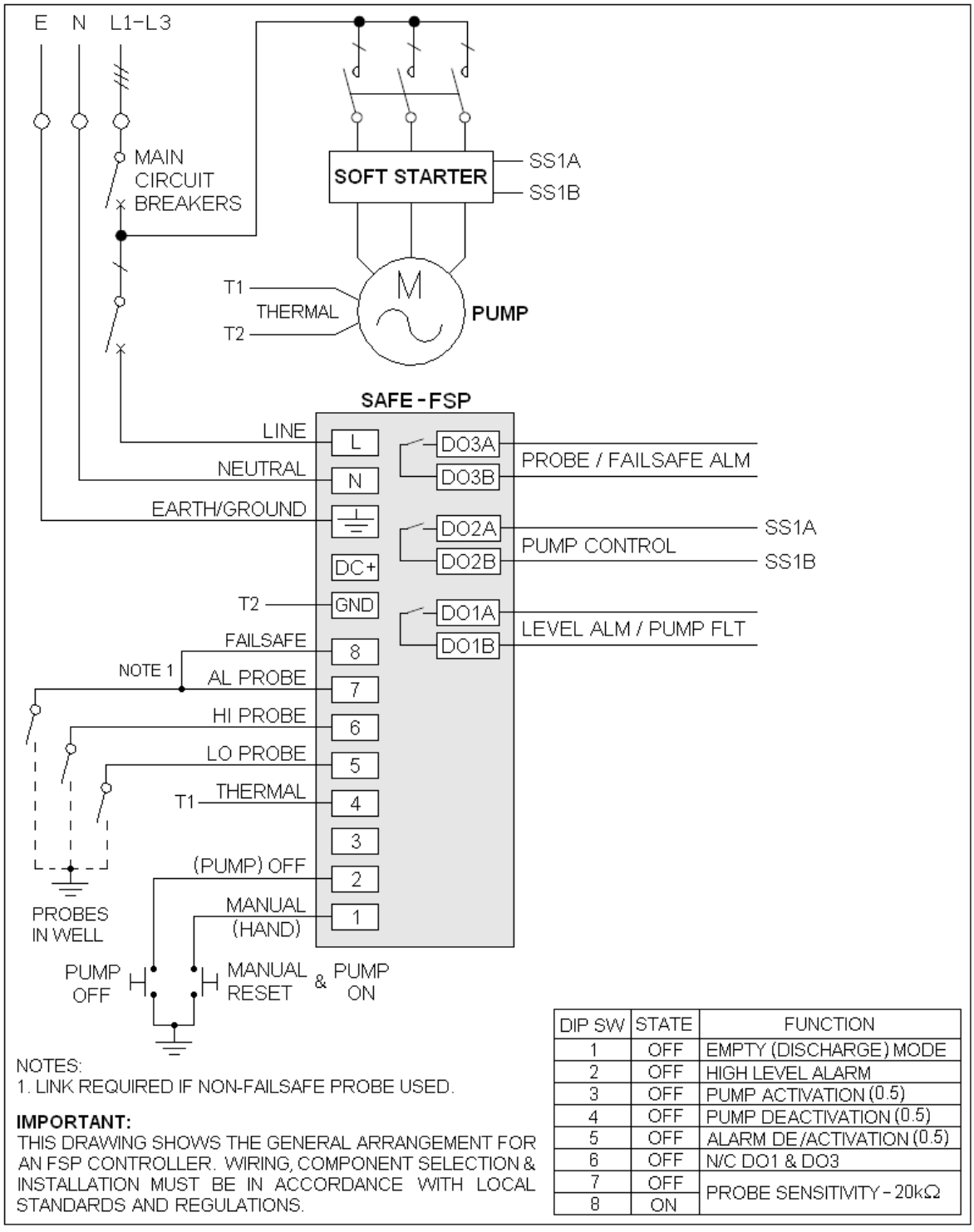
17.3 Simplex Pump Controller

In this example the FSP Controller is configured as the primary pump controller for a single pump (Figure 10). The FSP Controller takes no action until the High Level probe is covered. When it 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 and the Level Alarm/Pump Fault output (DO1) changes state.

The FSP Controller monitors the thermal sensor. (If a seal sensor is present, it is not connected to the FSP Controller).

The FSP Controller and associated probes can control a maximum of one pump.



DIP SW	STATE	FUNCTION
1	OFF	EMPTY (DISCHARGE) MODE
2	OFF	HIGH LEVEL ALARM
3	OFF	PUMP ACTIVATION (0.5)
4	OFF	PUMP DEACTIVATION (0.5)
5	OFF	ALARM DE/ACTIVATION (0.5)
6	OFF	N/C DO1 & DO3
7	OFF	PROBE SENSITIVITY - 20kΩ
8	ON	

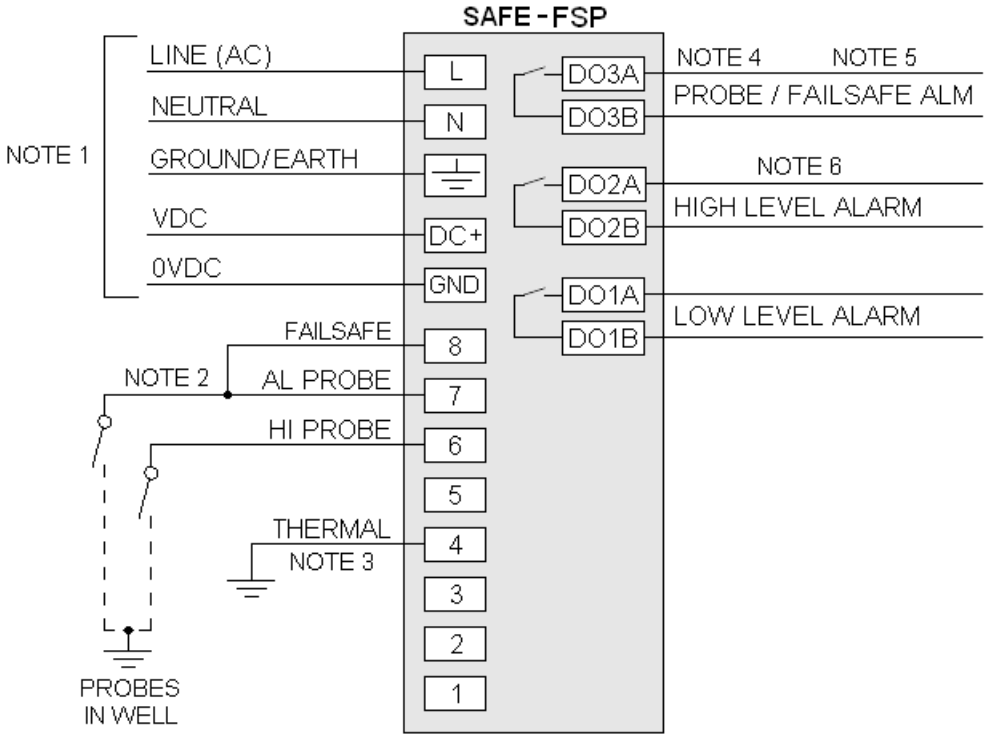
NOTES:
1. LINK REQUIRED IF NON-FAILSAFE PROBE USED.

IMPORTANT:
THIS DRAWING SHOWS THE GENERAL ARRANGEMENT FOR AN FSP CONTROLLER. WIRING, COMPONENT SELECTION & INSTALLATION MUST BE IN ACCORDANCE WITH LOCAL STANDARDS AND REGULATIONS.

Figure 10 – Simplex Pump Controller

17.4 High and Low Level Alarms

The example below (Figure 11) shows the FSP controller configured to indicate low and high level alarms only (no pump control).



DIP SW	STATE	FUNCTION
1	OFF	EMPTY (DISCHARGE) MODE
2	ON	LOW LEVEL ALARM
3	OFF	PUMP ACTIVATION (0.5)
4	OFF	PUMP DEACTIVATION (0.5)

DIP SW	STATE	FUNCTION
5	OFF	ALARM DE/ACTIVATION (0.5)
6	ON	N/O DO1 & DO3
7	OFF	PROBE SENSITIVITY – 20kΩ
8	ON	

ALARM STATUS	INPUTS		OUTPUTS *			LEDS
	AL PROBE	HI PROBE	DO1	DO2	DO3	
NO LEVEL ALARM	ON	OFF	OFF	OFF	OFF	NONE
FAILSAFE ALARM	ON	OFF	OFF	OFF	ON	PROBE FAULT
LOW LEVEL ALARM	OFF	OFF	ON	OFF	OFF	LEVEL ALARM
HIGH LEVEL ALARM	ON	ON	OFF	ON	ON	PUMP & PROBE FAULT

* DIP SW6 = ON

NOTES:

1. AC AND/OR DC SUPPLY CAN BE USED.
2. LINK REQUIRED IF NON-FAILSAFE PROBE USED.
3. LINK REQUIRED FROM THERMAL INPUT TO GROUND (>4kΩ = FAULT).
4. AN ASSUMED PROBE FAULT WILL BE PRESENT 10s AFTER THE HIGH LEVEL ALARM IS TRIGGERED.
5. IF FAILSAFE ALARM OUTPUT (DO3) IS ACTIVE WHEN NO HIGH LEVEL ALARM IS PRESENT IT INDICATES A FAILSAFE PROBE FAULT (IF FAILSAFE PROBE USED).
6. A FIXED 60s DEACTIVATION DELAY APPLIES TO THE HIGH LEVEL ALARM (IF PRESENT > 10s).

IMPORTANT:
THIS DRAWING SHOWS THE GENERAL ARRANGEMENT FOR AN FSP CONTROLLER. WIRING, COMPONENT SELECTION & INSTALLATION MUST BE IN ACCORDANCE WITH LOCAL STANDARDS AND REGULATIONS.

Figure 11 – Configured for High & Low Level Alarms Only

18 Backup Controller SAFE-FSP Label

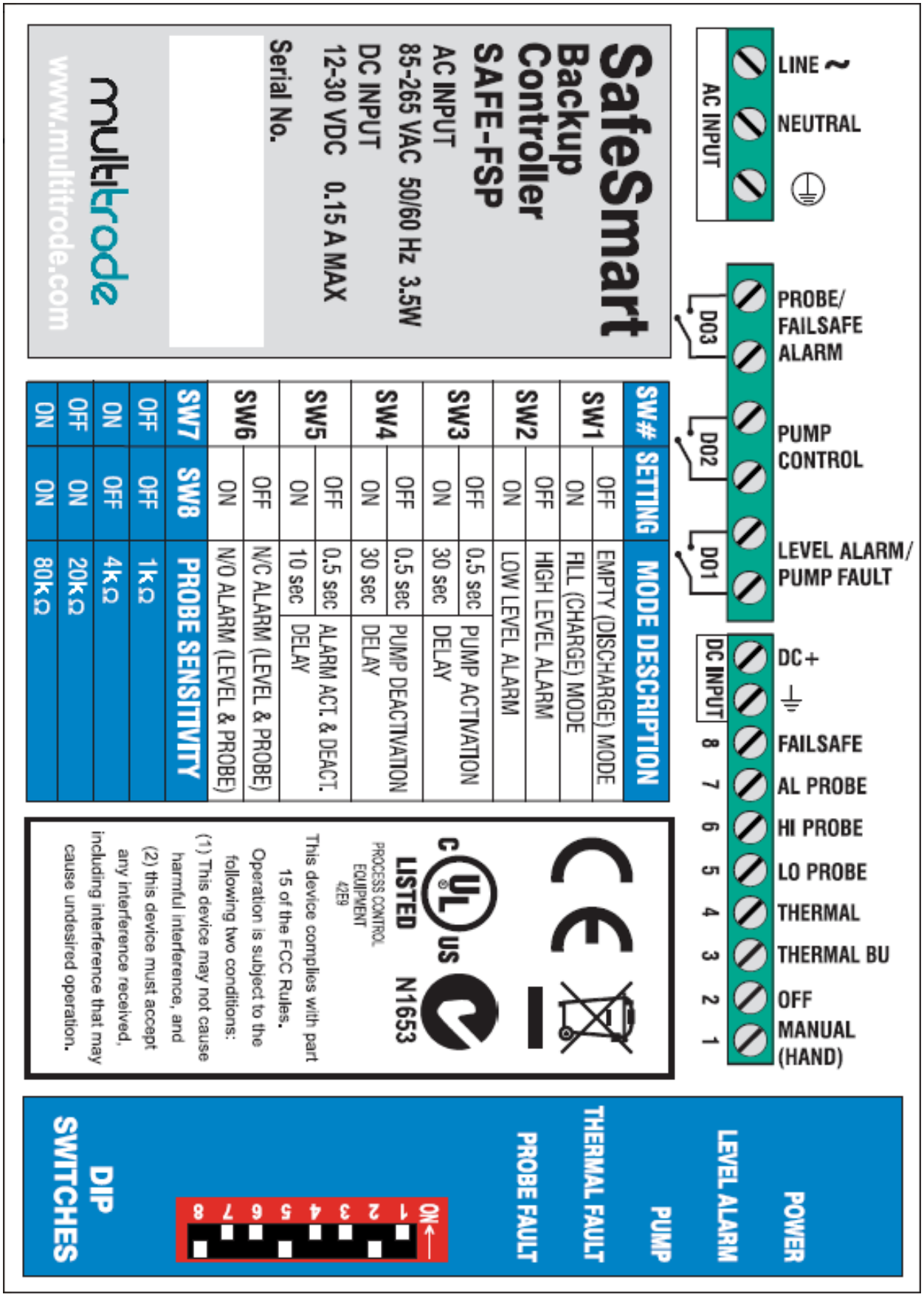


Figure 12 – SafeSmart SAFE-FSP Label

MultiTrode UK Ltd – Europe, ME & Africa Operations

Unit 5, Kingswood Court
Long Meadow, South Brent
Devon, England TQ10 9YS

Tel: +44 1752 547355
Fax: +44 1752 891932

E-mail: *UKsales@multitrode.com*

MultiTrode Pty Ltd – Head Office

Brisbane Technology Park
18 Brandl Street
Eight Mile Plains Qld 4113
Australia

Ph: +61 7 3340 7000
Fax: +61 7 3340 7077

E-mail: *AUsales@multitrode.com*

MultiTrode Inc – USA

Unit 3, 990 South Rogers Circle
Boca Raton Florida 33487

Tel: +1 561 994 8090
Fax: +1 561 994 6282

E-mail: *USsales@multitrode.net*

Visit www.multitrode.com for the latest information