

SAFESMART FailSafe Level Alarm Relay SAFE-FS

Installation & Operation Manual



This Manual is the support documentation for the installation, commissioning and operation of the SAFE-FS Level Alarm Relay.

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1 Warnings & Cautions

1.1 Information to User

Read through this manual to obtain a good working knowledge in order to get maximum performance from the product 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 SAFE-FS installation and wiring must be performed by qualified personnel.

DANGER:



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

2 Introduction

The Safe-FS is the next generation of ultra-reliable high level alarming for lift stations and pump stations. It is part of the new SafeSmart family from MultiTrode. It adds failsafe probe functionality, for example, for the situation where rats have been eating through cables. The -FS verifies that the high level alarm is always functioning.

- Adds failsafe test to the ultra-reliable probe
- Relay output for loss of probe - N/O or N/C
- Relay output for high level alarm - N/O or N/C
- LED indication for power, level alarm, loss of probe alarm

Over 100,000 pump stations around the world use MultiTrode probes for primary or backup control (or both). Utilities have moved away from ball floats because they are prone to tangle up and need frequent cleaning to avoid false readings from fats, oils and grease.

The MultiTrode single sensor probe eliminates the problems of ball floats, and the new fail-safe single-sensor probe adds an extra electrical connection to the sensor. The level alarm relay checks for continuity - so if a wire has become disconnected, or if rats have eaten the cable - an output is activated. This provides continuous verification to the utility that the probe is in operation.

The MTRA-FS Level Alarm Relay is designed to be easy to install and configure and operates from a 11 – 30 VDC power supply. 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 relay. During operation, the LED's on the front panel indicate the current status including Probe Fault and Level Alarm.

3 Specifications

Dimensions	
Width	22.5mm (7/8")
Height	101mm (4")
Length (depth)	120mm (4 3/4")
Environmental	
Ambient Temperature	-10 to 60 °C
Humidity	5% to 90% non-condensing
DC Power Supply	
Voltage Range	11 – 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

Table 1 - SAFE-FS Specifications

4 Installation

The SafeSmart SAFE-FS is designed to be mounted onto a standard DIN rail. All power supply, input and output connections are located on the top of the relay housing.

The features of the relay are listed below and are described in the following sections.

- Power Supply
- Level Alarms
- Failsafe Probe Alarm
- Probe Sensitivity
- LED Function
- DIP Switch Settings

5 Power Supply

The SAFE-FS requires a 11 – 30V DC power supply.

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 rating is listed in Table 2 below.

Unit Supply Range	Recommended Switch/Circuit-Breaker/Over current Protection Device Rating	Minimum Supply Wiring Rating
11-30V DC	0.15A	0.15A

Table 2 – Current Ratings

If the DC supply voltage drops below a threshold, the Power LED flashes and the Failsafe Probe Alarm output is activated. (If the power supply connected 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).



NOTE: *The MultiTrode probe uses an earth/ground return path for the signal. Ensure that the GND (DC-) terminal on the SAFE-FS relay is also grounded.*

6 Level Alarms

The SAFE-FS has the following alarm inputs:

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

- In High Level Alarm mode, the alarm activates when the AL Probe input detects liquid (after the activation delay has expired).
- In Low Level Alarm mode, the alarm activates when the AL Probe input no longer detects liquid (i.e. the level has dropped below the sensor) and the activation delay has expired.
 - High Level Alarm - DIP Switch 1 = OFF
 - Low Level Alarm - DIP Switch 1 = ON

When a level alarm is detected, the Level Alarm contacts are activated and the Level Alarm LED flashes. The alarm contacts can be used to operate a warning light or connected to a PLC / RTU or dialler for remote monitoring.

The Level Alarm output can be configured as Normally Open (N/O) or Normally Closed (N/C) via DIP Switch 4:

- N/C Level Alarm - DIP Switch 4 = OFF
- N/O Level Alarm - DIP Switch 4 = ON

6.1 Level Alarm Activation Delays

The activation delay can be extended from 0.5 to 10s. A 10s activation delay ignores the alarm condition (high or low level) if the sensor is triggered for less than 10s. It is configured via DIP Switch 2.

There are 2 delay periods:

- 0.5 sec - DIP Switch 2 = OFF
- 10 sec - DIP Switch 2 = ON

6.2 Level Alarm Deactivation Delays

The deactivation delay can be extended from 0.5 to 10s. A 10s deactivation maintains the alarm for 10s after the alarm condition has passed. It is configured via DIP Switch 3.

There are 2 delay periods:

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

7 Failsafe Probe Alarm

MultiTrode's Failsafe probe includes an extra connection to the top sensor which is used for failsafe detection. The SafeSmart relay utilises this connection to test the integrity of the connection to the sensor. If the cable to the sensor is broken, the relay detects this (after a short delay), the Probe LED starts flashing and the Probe Alarm contacts are activated. (The Failsafe Probe Alarm output can be configured as normally open or normally closed via DIP switch 5).

- N/C Failsafe Probe Alarm - DIP Switch 5 = OFF
- N/O Failsafe Probe Alarm - DIP Switch 5 = ON

If a standard or non-failsafe probe is used, a jumper **must** be connected between the AL Probe and Failsafe inputs to prevent probe fault alarms.

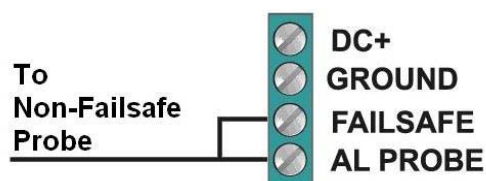


Figure 1 - Non-failsafe Probe Connection Diagram



NOTE:

The failsafe probe input must be connected to the highest probe in the system.

8 Probe Sensitivity

The relay 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 relay to 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 relay allows for the operator to adjust its sensitivity as needed for specific conditions. The sensitivity is set using Dip Switches 7 and 8, (see Table 3 below).

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 3 - Probe Sensitivity

- Not recommended for use with purified de-ionised water.

9 LED Function

Three LEDs on the front of the relay indicate the power and status of the level and probe alarms.

LED	Status	Indication
Power	Power On	Steady
	Low Voltage	Flashing
Level	Level Alarm Active	Flashing
Probe	Failsafe Alarm Active	Flashing

Table 4 – LED Function

10 DIP Switch Settings

The SAFE-FS is configured using the DIP switches located on the front of the relay enclosure.

DIP #	Setting	Mode Description	Section
1	OFF	High Level Alarm	6
	ON	Low Level Alarm	6
2	OFF	0.5 sec Level Alarm Activation Delay	6.1
	ON	10 sec Level Alarm Activation Delay	6.1
3	OFF	0.5 sec Level Alarm Deactivation Delay	6.1
	ON	10 sec Level Alarm Deactivation Delay	6.1
4	OFF	N/C Level Alarm	6
	ON	N/O Level Alarm	6
5	OFF	N/C Failsafe Probe Alarm	7
	ON	N/O Failsafe Probe Alarm	7
6	OFF	Not Used	-
	ON	Not Used	-
7	8	Probe Sensitivity	8
OFF	OFF	1k ohm	
ON	OFF	4k ohm	
OFF	ON	20k ohm	
ON	ON	80k ohm	

Table 5 – DIP Settings

11 Example Applications

11.1 Example 1 – High Level Alarm with Single Sensor Probe

A high level alarm is configured for a discharge/empty application. A Failsafe single sensor probe is used, (bridge terminal 2 to 1 if a standard probe is used). The Level Alarm contacts activate when the liquid level reaches the sensor.

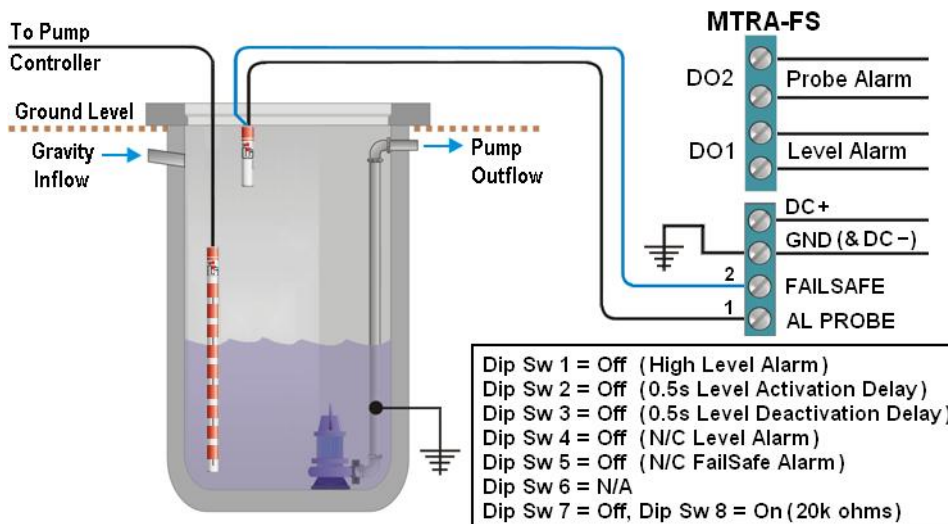


Figure 2 – High Level Alarm with Single Sensor Probe

11.2 Example 2 – High Level Alarm with 10 x Sensor Probe

A high level alarm is configured for a discharge/empty application. A Failsafe ten (10) sensor probe is used. The Level Alarm contacts activate when the liquid level reaches the highest sensor. The probe sensors can not be connected in parallel to two devices, so the highest sensor only goes to the FS relay.

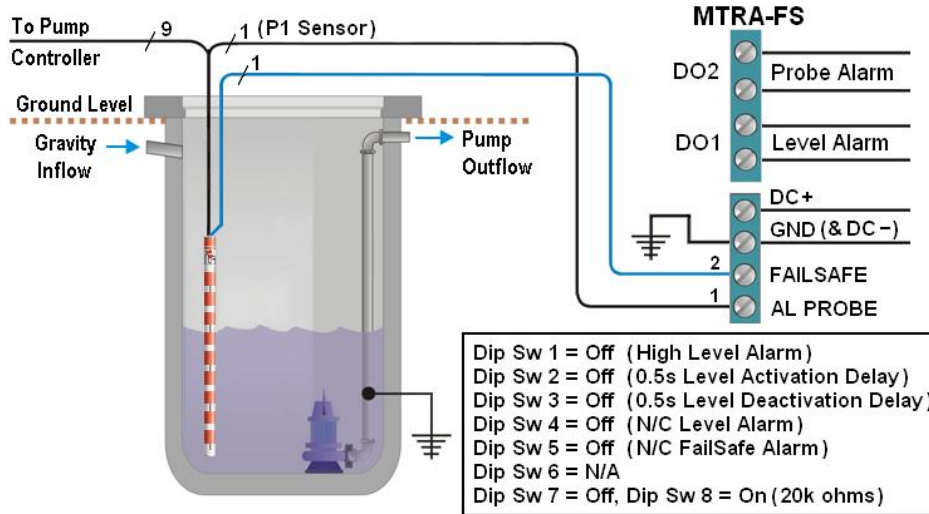


Figure 3 – High Level Alarm with 10 Sensor Probe

11.3 Example 3 – Low Level Alarm

A low level alarm is configured for a charge/fill application. The Level Alarm contacts activate when the liquid level falls just below the sensor.

A standard probe is used as there is little advantage in using a Failsafe probe as a low level sensor. While a Failsafe probe could be used to detect a connection failure to the sensor, in a charge/fill application the failure of the sensor would generate a low level alarm regardless due the nature of the probe. (Open circuit connection is equivalent to sensor uncovered).

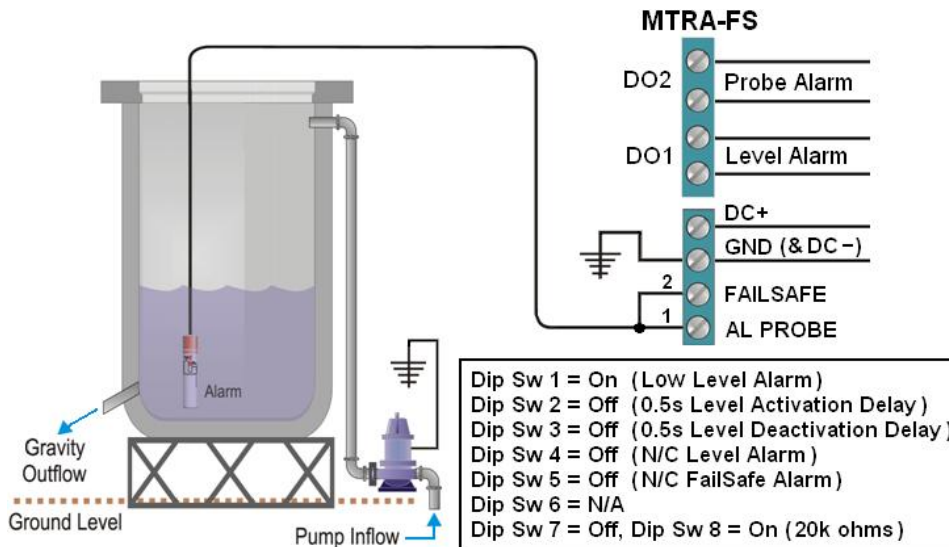


Figure 4 – Low Level Alarm

11.4 Example 4 – Wiring Diagram – High Level Alarm

The following wiring diagram illustrates the SAFE-FS configured for a high level alarm, with connections to a PLC / RTU or dialler (to receive alarms via SMS).

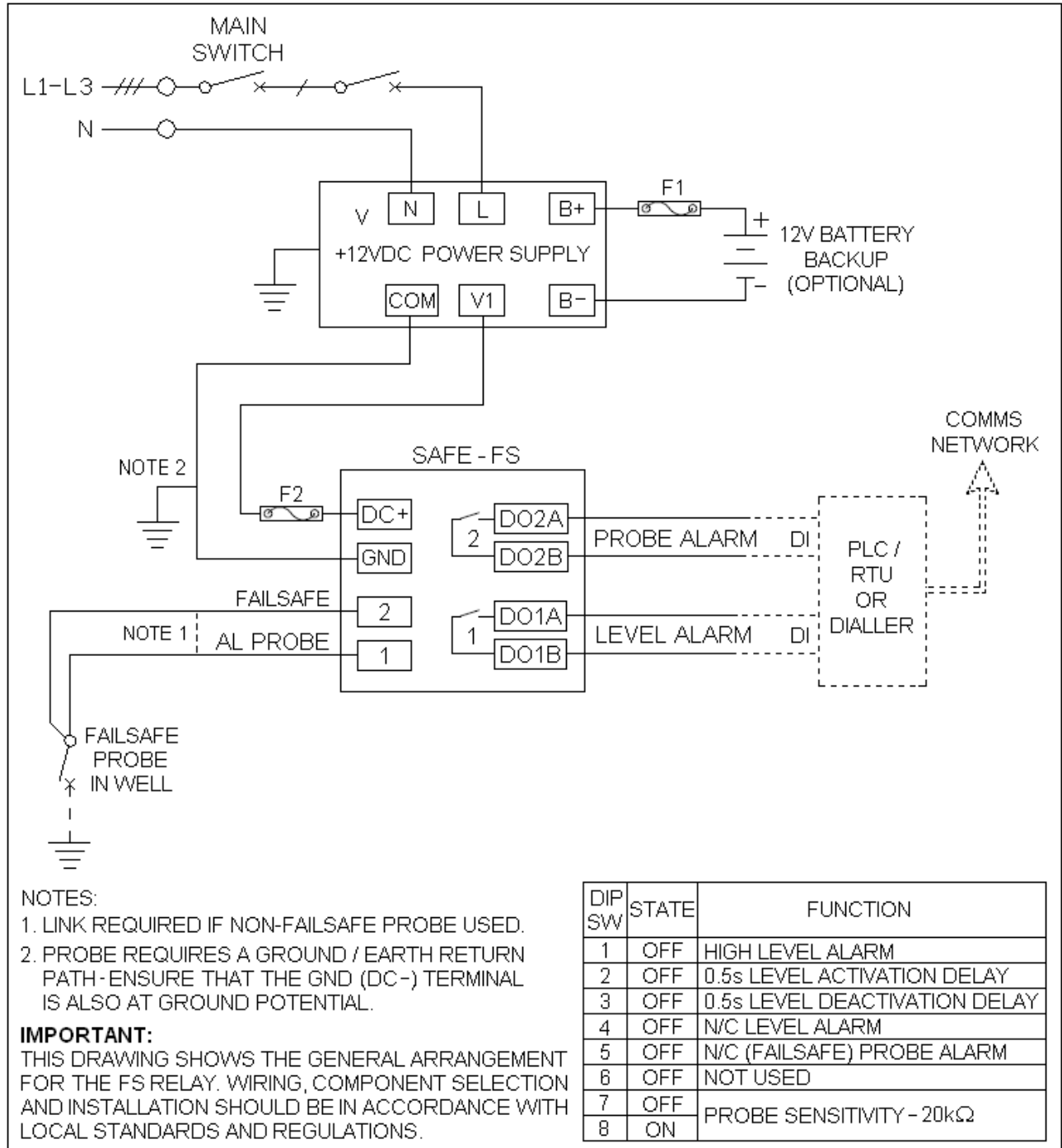


Figure 5 – Wiring Diagram for a High Level Alarm

Appendix A. Relay SAFE-FS Label

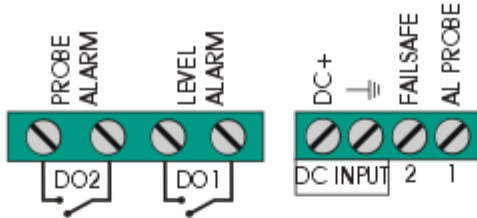
SafeSmart Alarm Relay

SAFE-FS

DC INPUT
11-30 VDC
0.15 A MAX

Serial No.


multitrode
www.multitrode.com



POWER


LEVEL ALARM

PROBE ALARM



DIP SWITCHES

SW#	SETTING	MODE DESCRIPTION	
SW1	OFF	HIGH LEVEL ALARM	
	ON	LOW LEVEL ALARM	
SW2	OFF	0.5 sec	LEVEL ALARM
	ON	10 sec	ACTIVATION DELAY
SW3	OFF	0.5 sec	LEVEL ALARM
	ON	10 sec	DEACTIVATION DELAY
SW4	OFF	N/C LEVEL ALARM	
	ON	N/O LEVEL ALARM	
SW5	OFF	N/C FAILSAFE ALARM	
	ON	N/O FAILSAFE ALARM	
SW6	OFF	NOT USED	
	ON	NOT USED	
SW7	SW8	PROBE SENSITIVITY	
OFF	OFF	1K Ω	
ON	OFF	4K Ω	
OFF	ON	20K Ω	
ON	ON	80K Ω	



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.