OPTI-FLOAT®

Engineering

ENGINEERING REPORT

In 1999 many states began enacting legislation to reduce mercury in products. The various legislations are designed to dramatically reduce the possibility of mercury release into the environment. Mercury is a toxic substance that the human body cannot breakdown. The FDA has warned consumers to limit or not eat certain types of fish because of mercury contamination. There are member states in the Interstate Mercury Education and Reduction Clearinghouse (IMERC) that have enacted legislation to ban mercury and mercury added products. As of June 2011 there were 15 member states – California, Connecticut, Illinois, Louisiana, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, Vermont, and Washington. More states will be joining and legislation will become more stringent.

There are many millions of mercury float switches in use in the world today. The mercury float switch has been the standard for decades. Until now the only replacement for mercury float switches were mechanical float switches. Mechanical floats have a very short life, much shorter than mercury floats due to the heavy mechanical and delicate electrical components used inside of the float housing. The life-limiting factor in mercury floats is the metallic electrical cable, many breaking due to fatigue after less than 90,000 operations. The life-limiting factor of mechanical floats are the individual internal components as well as the electrical cable.

Many users are replacing their mercury float switches as they break (or as may be legislated) with mechanical float switches, which are much less reliable. This causes a much higher maintenance cost, especially to an owner that has many pump stations in their system.

The best solution to this problem is the newly developed float switch that uses fiber optics instead of electricity. It is mercury and lead free and has been tested to over 15 million operations. This could be 10 or more times that of existing float switches it is designed to replace. It is built for durability and has been high impact load tested without failure.

This float uses advanced, very flexible, plastic fiber optic cable to transmit a beam of light from a light source in a remote transceiver to the float where the beam makes and breaks depending on the tilt of the float. The transceiver then detects the presence or absence of light and operates a relay in the transceiver, which in turn can then operate other devices. Since the float does not have any electrical parts or wires, there is no chance of an explosion in a wet well. For the first time floats can be used without the admission of electricity into an explosive area.

The float switch is the least expensive method of level detection in wastewater pump stations and systems. There are other commonly used types of electronic level detection systems such as bubblers, which use compressors and an air tube, submersible transducers, which have the pressure sensor located near the bottom of the wet well, ultra sonic systems, which use an ultrasonic sensor located near the top of the pump station to detect the water/air interface. In all of these other technologies, nearly all system designs have back-up float switches for use in the event of failure of these various types of equipment.

All wastewater systems should be designed in accordance with NFPA® 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities and referred to in NFPA® 70 – National Electrical Code (NEC). The purpose of this standard is to safeguard against fire and explosion hazards of wastewater treatment and associated collection systems and in pump stations. This document includes the hazard classifications of specific areas and processes. The hazards are produced typically by decomposition of organic compounds that produce, for example, methane gas and also from spills or illegal dumping of flammable substances that make their way into the wastewater system. This NFPA® document is an invaluable tool to the owner and engineer that use and design wastewater systems. The most common location of float switches in a wastewater system is in the wastewater pumping stations, which, according to NFPA 820, nearly all are considered Class 1, Division 1. This class and division is the highest category of a hazardous, explosive area. It requires the use of special interface equipment where electrical float switches connect to the control panel. The interface equipment is called barriers or intrinsically safe relays. These special devices limit the amount of voltage and current that can be produced when an electrical float switch fails, so that an explosion is less likely. When these intrinsically safe relays fail or if they are bypassed, then the system becomes unsafe.

The fiber optic float is an inherently safe device in that it has no electrical current passing through the cable. It cannot under any conditions produce arcs or sparks and cannot cause an explosion. Since it is non-electrical, it is also safe to handle and easier to install than conventional float switches.

The Opti-Float® level switch by Cox Research is very conservatively rated. It has been tested to 15 million operations directly connected to a size 2 motor starter without failing. The relays in the UL Listed controller have10 amp contacts but, the controller is conservatively rated at 3 amps. The maximum cable length successfully tested has been over 60 meters (200 feet) but it is conservatively rated at 30 meters (100 feet). Other aspects of the float is that the cable is made with plastic fibers which have a very small bending radius of less than 1/2”. The cable is very flexible and although not recommended, can be tied in knots without breaking. It can be installed in conventional conduit systems even with powered wires. No separation between electrical cables and optical cables are required. No special tools or experience are required for installation. The cable can be cut with a razor or other sharp instrument and connects to the transceiver with thumb screws. Retro-fit kits are available for easy replacement of conventional floats.

SUMMARY:

1. Mercury floats are being legislated out of existence.
2. At least one state is requiring the removal of all existing in-service mercury floats from wastewater and water systems.
3. Mechanical floats are very unreliable and have a short life.
4. Both mercury and mechanical float switches require intrinsically safe relays inside of the control panel for them to be used in hazardous areas such as wastewater pump stations.
5. The cost of optical float systems are about the same as that of electrical float systems properly designed for use in the hazardous atmospheres of wastewater pump stations.

6. Opti-Float® level switches are “Green” with all recyclable components and are RoHS compliant.
7. Opti-Float® level switches have been tested, without failure, to over 15 million operations, which is as much as 10 times that of many electrical float switches.
8. Retro-kits are available for easy conversion of electrical float systems to optical systems.

NFPA® 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities is available from NFPA, 1 Batterymarch Park, Ouincy, MA 02169-7471.
NFPA® is a registered trademark of National Fire Protection Association – an International Codes and Standards Organization.
RoHS represents the European Union “Restriction of Hazardous Substance Directive” which took effect July 1, 2006.
Opti-Float® and Optical Float® are registered trademarks of Cox Research and Technology, Inc. Baton Rouge, La.- coxresearch.com . The Opti-Float® level detector has both US and foreign patent protection.
Information on IMERC can be obtained at www.**newmoa.org**/prevention/mercury/**imerc**.cfm

WHITE PAPER
OPTI-FLOAT® LEVEL DETECTORS AND UL 913

By: Raleigh L. Cox P.E.

The NEC defines a device like the Opti-Float® level detector as a "Simple Apparatus" because it does not generate any voltage, current or power. Article 504.10 (B) states "Simple apparatus shall be permitted to be installed in a hazardous (classified) location …" ANSI/ISA TR12.21.01, Article 6.2 defines a device like the Opti-Float® level detector as "Inherently Safe" because the intensity of the light beam is so small (18 times less than that of sunlight) that there is no chance of ignition of hazardous materials under any conditions of operation. As indicated in Table 4 of the document, an inherently safe device can be used in Class 1, Divisions 1 and 2 and all Zone classifications. This includes Class 1, Zone 0, which is so severe, according to NEC 505.15 (A) and the NEC Handbook commentary, that even explosion proof motors cannot be used in this zone.

The UL 913 standard was developed for wired devices that have power on both sides of an electrical circuit. The circuits are electrically isolated, as much as practical, to provide maximum separation of the high voltage source from the low voltage device voltage. In the case of electrical float switches, there is a voltage present at the float as well as in the electrical wires that connect the isolator to the float. This voltage is small enough such that an arc or spark in the float circuit cannot produce sufficient energy to cause an explosion. However, should the isolator become damaged by simple failure of the device, power surges, lightning or manual bypassing by maintenance personnel, then all of this protection is nullified. For many years, this was the only way to utilize float switches in hazardous area sewer system wet-wells.

Opti-Float ® systems cannot impart any voltage in the hazardous area no matter what the cause of failure since all cable and devices are optically isolated from all sources of electricity in the control panel. Power surges and lightning cannot impart any voltage in the wet-well by way of the plastic fiber optic cable. Also the transceivers cannot be manually bypassed.

Opti-Float® level detectors are quickly becoming the industry standard due to the following:

1. Mercury free – Mercury floats are being banned throughout the US and internationally.
2. Safety – No electricity is present in the float or connecting optical cable.
3. Long Life – They have an extremely long life – ongoing testing of multiple floats is now at over 15 million operations (150 times that of the best electrical float tested). This essentially is a lifetime.
4. Maintenance - Can be tested by observation. No electrical meters are required to see if a float is operating. Simply look into the end of one of the fibers and see the making and breaking of the light beam.
5. Cost – Opti-Float® systems are about the same price as intrinsically safe relay float systems.

Raleigh Cox is a licensed Electrical and Environmental engineer. He has over 40 years of design experience in environmental and electrical power and control systems. He holds over 20 patents in these fields.

OPTI-FLOAT® LEVEL DETECTORS AND THE NEC

The National Electrical Code has provisions for simple apparatus devices to be considered safe for use in classified areas.

In article 504 of the NEC there is the definition of a simple apparatus. It is a device that does not generate more than 1.5 volts, 100 milliamps and 25 milliwatts or a passive component that does not dissipate more than 1.3 watts. The Opti-Float® level detector is a passive simple apparatus. Article 504.10 (B) states that "Simple apparatus shall be permitted to be installed in any hazardous (classified) location in which the maximum surface temperature of the simple apparatus does not exceed the ignition temperature of the flammable gases or vapors, flammable liquid, combustible dusts, or ignitable fibers/flyings present."

The Opti-Float® level detector, being non-electric, operates at 0 volts, 0 milliamps and will be at ambient temperature. The power has been measured at the LED transmitter located remote from the float at 0.132 milliwatts into the cable. Measurements were taken with a new Industrial Fiber Optic Test Set serial number A13659 into a 12" long, 1mm plastic fiber cable of the type used in the float. There is no laser light used with Opti-Float® systems. The light beam is dominate at 660 nm which is visible red light. ANSI/ISA TR12.21.01 Table 2 indicates a safe operating power level for optical cables in Class 1, Division 1, Groups A,B,C and D areas is below 35.0 milliwatts.

The float cable is composed of twin 1mm, PMMA plastic fiber optic cables each with a polyethylene covering and both inside of an overall PVC flame retardant VM-1 jacket with plastic fillers. The cable has no metal components and megs at infinity. There is no possibility of any electrical arcing and sparking from a damaged float or float cable and it is therefore inherently safe.

Electrical float systems are required to use intrinsically safe relays to limit the voltage and current on the electrical float wires. This system can become unsafe if the intrinsically safe relays fail due to power surges, other possible malfunctions, or manual bypassing. A failure of the optical float transceiver cannot impress any voltage and current on the float or cable.

The Opti-Float® system has been tested numerous times to over 15 million operations without failure, which means that they will last 10 or more times longer than conventional electrical floats which will result in tremendous long term savings to end users. The optical floats and cables are also recyclable and RoHS compliant.

RoHS represents the European Union "Restriction of Hazardous Substance Directive" which took effect July 1, 2006.

OPTI-FLOAT LEVEL DETECTORS AND ANSI/ISA -TR12.21.01

ANSI/ISA – TR12.21.01 2004 “Use of Fiber Optic Systems in Class 1 Hazardous (Classified) Locations” provides guidelines for the reduction of hazards when using fiber optic cable.

The referenced document describes three (3) types of general protection concepts for Class 1 hazardous locations in Section 6, Article 6.1 as follows:

a.) Inherently safe optical radiation (Article 6.2)
b.) Protected optical fiber cables (Article 6.3)
c.) Optical radiation interlock with optical fiber breakage (Article 6.4)

The Opti-Float® level detector falls into category a – **Inherently Safe**, which does not require any of the protections required in categories b and c or any other special precautions because the intensity of the light in the visible and near infrared region, which is what is used in the Opti-Float® systems, is so small that there is no chance of ignition by the light beam under any conditions. This is more fully described below.

ANSI/ISA definition of inherently safe (Article 6.2) – “Visible, near infrared, or mid infrared radiation that is **in**capable of producing sufficient thermal energy under normal or specified fault conditions to ignite a specific hazardous atmospheric mixture is inherently safe.” The Opti-Float® system operates at a dominate wavelength of 660 nm which is visible red light.

Article 6.2.2, Table 2 describes safe values of beam strength to be considered inherently safe. This is summarized as follows:

SAFE OPTICAL POWERS FOR OPERATION IN DIVISION 1 LOCATIONS

Material Groups	A	B	C	D
Power milliwatts (mW)	35	35	35	150
Power Density mW/sq.mm	5	5	5	20

The Opti-Float® system uses an IF-E97 LED in a UL Listed controller that under maximum conditions cannot produce more than 0.425 mW of power into the cable at the surface of the LED. With a cable diameter of 1mm, which is what is used, the power density will be a maximum of 0.541 mW/sq.mm. This power and power density is far below the safe levels listed in ANSI/ISA TR12.21.01.

Article 6.5, Table 4 is “Application of Protection Concepts for Fiber Optic Systems Based on Class 1 Divisions and Zones”. There are 8 individual categories. The first 7 relate to concepts with an “ignition capable beam” with various described methods of protection. Category 8 is “Inherently safe” (no ignition capable beam). **In this category is listed Division 1, Division 2, Zone 0, Zone 1 and Zone 2 as being acceptable for use of inherently safe fiber optic systems.**

Field measurements were also taken with a new Industrial Fiber Optic Test Set serial number A13659 into a 12" long, 1mm plastic fiber cable of the type used in the float. The measured power level was 0.132 mW (0.168 mW/sq.mm). At Noon on March 11, 2009 at 30.3 degrees North Latitude sunlight was measured by the same instrument using the same measuring procedure and found to be 2.42 mW (3.08 mW/sq.mm) This indicates that the measured **sunlight had a power and power density of 18.3 times that of the Opti-Float® system** which further indicates the insignificance of the light beam used in the Opti-Float® system.

ANSI – American National Standards Institute, 1819 L Street, NW, 6th Floor, Washington, DC 20036.
ISA – International Society of Automation, 67 Alexandria Drive, Research Triangle Park, NC 27709.

820

NFPA® 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities 2008 Edition

NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

Table 4.2 *Continued*

Row	Line	Location and Function	Fire and Explosion Hazard	Ventilation	Extent of Classified Area	*NEC*-Area Electrical Classification (All Class I, Group D)	Material of Construction for Buildings or Structures	Fire Protection Measures
16	a	WASTEWATER PUMPING STATION WET WELLS Liquid side of a pumping station serving a sanitary sewer or combined system	Possible ignition of flammable gases and floating flammable liquids	A	Entire room or space	Division 1	NC, LC, or LFS	CGD
	b			B		Division 2		
17	a	BELOWGRADE OR PARTIALLY BELOWGRADE WASTEWATER PUMPING STATION DRY WELL Pump room physically separated from wet well; pumping of wastewater from a sanitary or combined sewer system through closed pumps and pipes	Buildup of vapors from flammable or combustible liquids	C	Entire space or room	Unclassified	NC, LC, or LFS	FE
	b			D		Division 2, or unclassified, if space provided with pressurization in accordance with NFPA 496		
18		ABOVEGRADE WASTEWATER PUMPING STATION Pump room physically separated with no personnel access to wet well; pumping of wastewater from a sanitary or combined sewer system through closed pumps and pipes	NA	NR	NA	Unclassified	NC, LC, or LFS	FE

Notes:
(1) The NR designation in the ventilation column indicates that no ventilation requirements are established for the space, and, therefore, Table 9.1.1.4 also has no requirements.
(2) Row and Line columns are used to refer to specific figures in A.4.2 and specific requirements for each location and function.
(3) The following codes are used in this table:
A: No ventilation or ventilated at less than 12 air changes per hour.
B: Continuously ventilated at 12 changes per hour or in accordance with Chapter 9.
C: Continuously ventilated at six air changes per hour or in accordance with Chapter 9.
CGD: Combustible gas detection system.
D: No ventilation or ventilated at less than six air changes per hour.
FDS: Fire detection system.
FE: Portable fire extinguisher.
LC: Limited-combustible material.
LFS: Low flame spread material.
NA: Not applicable.
NC: Noncombustible material.
NEC: In accordance with NFPA 70.
NNV: Not normally ventilated.
NR: No requirement.

(continues)

Specification

SECTION 16216

FLOAT SWITCH LEVEL DETECTORS

PART 1 GENERAL

1.01 SCOPE

A. The contractor shall furnish and install all float switches as shown on the drawings and as required for a complete and properly operating system.

1.02 REFERENCES

A. NFPA 70 –National Electrical Code, National Fire Protection Association, Latest Edition.

B. U.L. 508 A – Industrial Control Panels, Underwriters Laboratories, Inc., Latest Edition.

PART 2 PRODUCTS

2.01 FLOAT SWITCHES AND TRANSCEIVERS

A. The floats shall use fiber optic cable to transmit a beam of light from a transmitter in the control panel to the float where the beam makes and breaks depending on the tilt of the float. The receiver in the control panel shall detect the presence or absence of light and operate a relay in the receiver. The float shall have no electrical components or metallic wires that could cause arcs and sparks in an explosive atmosphere.

B. The float switch shall be mercury and lead free and shall be made of all safe, recyclable materials. The float switch housing shall be polypropylene. It shall be a simple robust device designed for many years of dependable service. The beam eclipser shall be stainless steel in an inert non-toxic dampening fluid that prevents chatter due to wave action. The viscosity of the fluid shall not change significantly over the range of –50 to +155F (-45 to +70C). The transceivers (transmitter and receiver combination) shall be dual din rail mounted units capable of connection to 2 floats. Provide one dual transceiver for every 2 floats. The fiber optic cable shall be custom made for the float and shall consist of dual plastic fibers with an overall specially blended PVC sheath for flexibility. No special tools or experience shall be required for connection of the optical cable to the transceivers. The cable shall be connected and sealed at the float housing using a double seal method that will prevent water from entering the float even if the outer sheath is damaged. The float color shall be two tone with the lighter color on the dome for easier viewing underwater when tilted up.

C. The transceivers shall operate in ambient temperatures of –15 to +130F (-25 to +55C). The transceivers shall operate at 12 VDC and shall be protected against accidental polarity reversal. The system shall operate in the visible and infrared light region with wavelengths between 400 and 1200 nm. The output relays in the receivers shall have the capability of being connected normally open or normally closed. The transceivers shall have a green led power-on light and red led lights on each channel indicating that the light beam is being received – float tilted up. The floats shall operate in liquid temperatures of +32 to +130F (0 to +55C). The floats shall have an ambient air standby operating temperature rating of –15 to +155C (-25 to +70C).

D. The float switches and transceivers shall be the Optical Float® level detection system by Cox Research and Technology, Inc., Baton Rouge, La. The dual transceivers shall be model TR2, and the floats shall be Opti-Float® model F1.

PART 3 EXECUTION

3.01 INSTALLATION

A. The contractor shall install the float switches and accessories in accordance with the manufacturers instructions and as shown on the drawings.

3.02 STORAGE

A. All equipment shall be stored in a weather protected location.

END OF SECTION

Frequently Asked Questions

QUESTIONS AND ANSWERS

1. Q. How long will the float last?

   A. We have run extensive tests on them and found that the floats, as well as the controllers, consistently last well over 15 million operations without failure. In fact, we have never had one fail in the test stand or anywhere else. Electrical floats consistently fail at the point of maximum repeated bending stress of the copper wires, which is near the float housing. Copper wire has a much higher modulus of elasticity and fatigues very quickly. The Opti-Float® level detector uses plastic fiber cable and is nearly indestructible in float switch applications. It has a life of 10 or more times that of conventional electrical floats.

2. Q. Having a fiber optic cable, are there any special precautions that we have to take to avoid problems?

   A. No. The fiber optic cable used with the Opti-Float® level detector was custom designed for the application. The fibers are plastic, not glass, and can be tied in knots, although not recommended, without harm. The cable jacket can be stripped with standard coax cable strippers or simple strippers that we can supply. The ends of the fibers are not to be stripped. They are only to be cut with a sharp instrument such as a razor or a cutter that we can supply. The ends do not need to be polished, and push easily into the controller connector without tools.

3. Q. Are there any special requirements for hanging the floats in a wet-well?

   A. No. Attach them as you would any other float. We do have recommendations as to the best methods of attachment to cables, chains and pipe that will give you the least amount of trouble with slippage, etc. These methods can be applied with any type of hanging cable, even with electrical floats. You can see them on our web site or call us and we will send you a booklet.

4. Q. Is the controller rated for use directly with motor starters or do we need to have interface relays in the circuit?

   A. The controller has 10 amp Potter and Brumfield relays on the circuit board. We conservatively rate them at 3 amps,120 and 240 volts. We have tested the controller to over 15 million operations, without failure, energizing and de-energizing a size 2 motor starter which will start a 25 HP, 480 volt motor. For size 3 and above we recommend the interface relays. We do not recommend connecting the controller directly to a motor where full motor current will pass through it.

5. Q. What is the maximum length of cables that are available?

A. We stock 30 and 60 foot cables but can supply cables up to 100 feet or longer. Call us with your special requirements.

6. Q. In how deep of water has the float been tested?

A. It has been tested in a water filled pressure chamber with the optical cables exiting the chamber to 300 feet of water pressure without failure or deformation of the float or the cable. The unique shape of the float distributes the forces of compression equally around the float and produces its strength.

7. Q. How do you keep the float from chattering in turbulent water?

A. We have designed it that way. The light eclipser inside of the float operates in a dampening fluid with a very wide operating temperature range. This dampening fluid slows the eclipser down using the same principle as shock absorbers on an automobile. Also the controller is designed with a small inherent time delay before operating the relays. These two features eliminate the problems associated with float chatter.

8. Q. Why is the Opti-Float® level detector two-tone in color?

A. The 2 tone patented feature has a purpose. It is light in color on the dome so that you can easily see, by looking down into the water, if the float is tilted up or down.

9. Q. How rugged is the float from abuse.

A. For testing purposes only, the Opti-Float® level detector has been tested with abuse with everything from sledge hammers to base ball bats to slamming them into concrete at high velocity, all without failure. However we do not recommend abuse and specifically caution against it.

10. Q. How do we convert an existing electrical float panel to optical floats?

A. There are 3 ways to do this. First there is an external retro-fit package consisting of the controllers, power supply, circuit breaker and terminal strips all inside of an outdoor NEMA 4X non-metallic or stainless steel enclosure. Simply mount this enclosure adjacent to your existing control panel. Remove the existing floats and wire from the terminals in the retro-fit enclosure to the terminals in the existing control panel on which the electrical float wires were connected. Power with 120 vac from the existing control panel. Install the Opti-Float® level detectors and you are done. The second method is to use an open assembly consisting of the same components, except without the enclosure, all pre mounted on a small aluminum plate that may fit into existing space inside of your existing control panel. Connections are made similarly. The third method is to mount the individual components inside of your existing control panel and again wire similarly.

11. Q. What types of accessories do you have?

A. We have many accessories including external weights, cable strippers, cutters, splice kits and unique hanging devices. You can find our catalog and other information on these devices on our web site.

12. Q. Can the optical cable be spliced?

A. Yes. Although it is best to order the floats with the correct length of cable, the cable can be easily spliced if necessary. See our web site for more information or give us a call.

13. Q. How much do they cost?

A. Opti-Float® systems cost about the same and in many cases less than standard intrinsically safe systems with electric floats and interface relays. Nearly all waste water pump stations require compliance with NFPA Standard 820 which classifies most wet-wells as a Class 1, Division 1 hazardous area. Combining this with the extremely long life of 10 or more times that of conventional electrical floats, and even using them in less stringent Class 1, Division 2 or Unclassified areas, the cost of changing out conventional electrical floats makes the Opti-Float® level detectors by far the best value.

14. Q. Where do we purchase the floats and accessories?

A. They can be purchased from our national distributors. Contact us with your requirements and we will direct you to your distributor.

15. Q. What is the warranty on the floats?

A. Standard warranty is for 3 years. Longer warranties are available.

16. Q. Can we get quantity discounts.

A. Yes. Contact us with your requirements.

17. Q. How can the Opti-Float® level detectors lower our maintenance cost?

A. The Opti-Float® level detectors and accessories have been tested without failure to well over 15 million operations. Most electrical floats will fail with less than 100,000 operations. This means that you will probably change out 10 electrical floats before you change out 1 optical float. This is due primarily to the use of the plastic fiber cable instead of metallic wires. The plastic fiber cable can be bent through full 180 degree cycles many times more than copper wires.

18. Q. Is the float RoHS compliant?

A. Yes. It is considered “Green” technology. It is all recyclable and RoHS compliant. RoHS is the European Union “Restriction of Hazardous Substances Directive” which took effect July 1, 2006.

19. Q. What is the angle of operation of the float?

A. The Opti-F1 is a narrow angle float. It will operate with as little as 1 degree of tilt from horizontal. However, due to the anti-chattering liquid in the activation device, there may be a slight time delay. Special floats are available that do not have the time delay. Contact Cox Research with your requirements.

20. Q. Are the floats sensitive to rotation?

A. No. The activating device is on the center axis to the float and is thus independent of the rotation of the float.