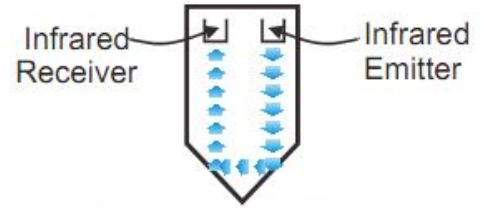


# NSD OPTICAL SWITCH OPERATION MANUAL

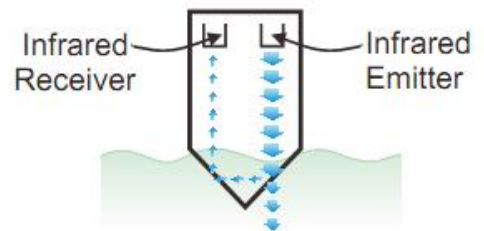
## PRINCIPLE OF OPERATION

The optical switch operates by the principle of Snell's law: When light moves from a medium of a given refractive index ( $n_1$ ) into a second medium with refractive index ( $n_2$ ), both reflection and refraction of the light may occur. An incident light ray strikes at a point on the interface between two media of refractive indices  $n_1$  and  $n_2$ . Total internal reflection is an optical phenomenon that occurs when a ray of light strikes a medium boundary at an angle larger than a particular critical angle with respect to the normal to the surface. If the refractive index is lower on the other side of the boundary, no light can pass through and all of the light is reflected. When light crosses a boundary between materials with different refractive indices, the light beam will be partially refracted at the boundary surface, and partially reflected.

Optical switches operate by sensing the difference in the refraction index between various mediums, causing different degrees of refraction and penetration. When the liquid is not in contact with the sensor, all transmitted light is reflected back to the receiver. When the liquid contacts the sensor, part of the transmitted light is reflected back to the receiver and part is emitted into the liquid. The receiver senses this difference in signal loss and switches accordingly.



Dry  
Total Internal Reflection  
Fig.1



Wetted In Liquid  
Partial Internal Reflection  
Fig.2

## FEATURES

1. PNP Open-Collector Output
2. Housing Material: Polysulfone or 316SS
3. Over-current & Reverse Polarity Protection
4. LED status indication

## SPECIFICATIONS

1. Housing Material: Polysulfone or 316SS  
Sensing Tip Material: Polysulfone
2. Protection Rating : IP68
3. Process Temperature: 14-250 °F
4. Ambient Temperature: 14-175 °F
5. Max. Operating Pressure:  
Polysulfone: 140 PSIG  
316SS: 560 PSIG
6. Input Power: 10-28 VDC
7. Load Current: 100mA Max.
8. Overload Current Protection: 100mA
9. Process Connection: 3/8" NPT
10. Cable: 2 m PVC Jacket, 24 AWG, 3-conductor

## DIMENSIONS

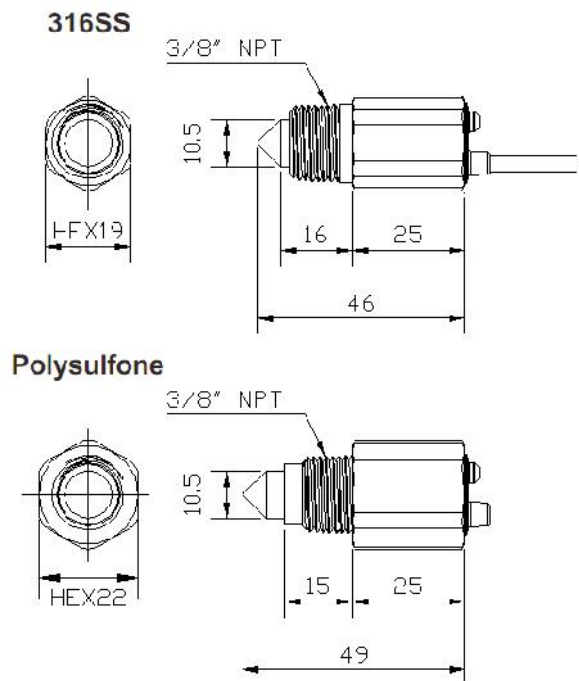
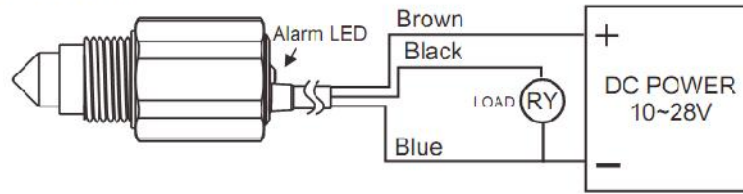


Fig.3

# WIRING

## PNP output



## APPLICATION EXAMPLE

### Liquid Level Control:

In Fig.4(a), two optical switches are installed individually at the desired upper and lower levels of the tank. When the level in the tank drops and the lower optical switch is no longer covered by liquid, it will change state and signal the controller to begin the filling process. Upon reaching the upper optical switch, the switch will change state and signal the controller to stop the filling process, thus maintaining the liquid level between the upper and lower optical switches.

### Motor Protection:

In Fig.4(b), the optical switch is installed in the lower level of the tank to prevent pump burnout caused by the lack of water/liquid. Avoid installation within a corner.

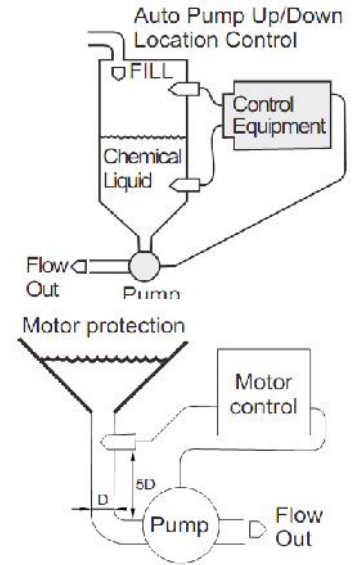


Fig.4(b)

## CAUTIONS

- Always apply an appropriate sealing compound around the sensor threads (PTFE Liquid or Tape is suggested) before installation
- Maximum Installation Torque: 316SS = 8 Lb-Ft, PSU = 4 Lb-Ft.
- The optical switch is not recommended for use in emulsions or phase-change liquids
- Do not install sensor close to other infrared sources
- The tip of the optical sensor must remain at least 1.2" from any reflective surface or physical interferences, like the tank wall (Fig.5)
- This product is not recommended for use with organic solvents or highly viscous or coating type liquids which can remain on the lens surface
- Clean the lens periodically using appropriate methods and compatible products
- Do not use organic solvents or scrub while cleaning to avoid scratches on the lens surface

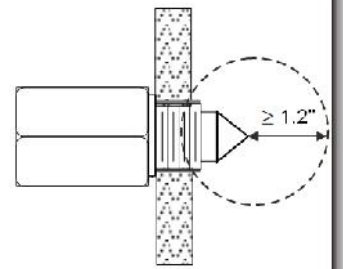


Fig.5

## ORDERING INFORMATION

Example:

Housing Material:

**G:** Polysulfone **6:** 316SS

Connection Thread:

**AU:** 3/8"NPT

Output Form:

**P0:** PNP N.C. (Dry ON) **P1:** PNP N.O. (Wet ON)

**NSD- G AU P1**



**KOBOLD Instruments, Inc.**

1801 Parkway View Drive Pittsburgh, PA 15205

phone: 412.788.2830 fax: 412.788.4890

e-mail: info@koboldusa.com web-site: www.koboldusa.com

Order from: **C A Briggs Company**

622 Mary Street; Suite 101; Warminster, PA 18974

Phone: 267-673-8117 - Fax: 267-673-8118

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r1\_04-2013