

INCH-POUND

A-A-59806

28 February 2008

SUPERSEDING

MIL-S-24771(SH)

08 April 1992

COMMERCIAL ITEM DESCRIPTION

LIQUID LEVEL SWITCH, SIDE MOUNTED, FLOAT ARM MAGNET-ACTUATED TYPE, SHIPBOARD SEWAGE AND GRAYWATER SYSTEMS

The General Services Administration has authorized the use of this commercial item description as a replacement for MIL-S-24771 for all Federal agencies.

1. SCOPE. This Commercial Item Description (CID) covers the requirements for side mounted, float arm magnet-actuated, liquid level switches used to indicate discrete points of fluid level.

1.1 Intended use. The liquid level switches specified are intended for use in shipboard sewage Marine Sanitation Devices (MSDs) and Graywater Collection and Transfer (GWCT) systems aboard surface ships or craft. An MSD is any equipment onboard a ship or craft designed to receive and treat sewage (blackwater) to a level acceptable for overboard discharge, or which receives and retains sewage onboard for later discharge ashore or in waters where discharge is permissible. The U.S. Navy uses the term "MSD" to also refer to equipment that receives and treats a combined sewage and graywater waste stream. The switches are used in conjunction with pump control and alarm circuitry to govern pump operation and activate tank high and low level alarms installed in MSDs and GWCT systems.

2. CLASSIFICATION. The liquid level switch shall conform to the following types:

Type I – Liquid Level Switch, Regular Flange

Type II – Liquid Level Switch, Special Flange

Type III – Liquid Level Switch, Square Flange

3. SALIENT CHARACTERISTICS.

3.1 Materials. The material for liquid level switches shall be as specified herein.

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: Commander, Naval Sea Systems Command, ATTN: SEA 05M2, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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3.1.1 Corrosion. Liquid level switch parts in contact with sewage or graywater shall be made of materials resistant to corrosion by these wastes. Shipboard sewage contains freshwater or seawater mixed with various concentrations of human wastes and fixture (water closet and urinal) cleaning agents in accordance with NAVSEA S6480-A4-CAT-010 (Authorized Chemical Cleaning Products and Dispensing Systems Catalog), with most of the cleaners belonging to the following chemical component/cleaning families:

- a. Quaternary ammonium compounds (Chemical Abstracts Service (CAS) Numbers 32426-11-2, 5538-94-3, and 68424-85-1)
- b. Inorganic borates
- c. Ethoxylated alcohols
- d. Dipropylene glycol monomethyl (DPM) ether (CAS Number 034590-94-8)
- e. Betaines
- f. Alpha olefin sulfonates
- g. Alkanolamides
- h. Alkanolamines
- i. Hydrotropes
- j. Hydroxides (potassium, sodium, ammonium)
- k. N-Alkyl dimethylamine oxides
- l. Acids (sulfamic, muriatic, phosphoric, citric, glycolic)
- m. D-Limonene (CAS Number 5989-27-5)
- n. Sodium metasilicate pentahydrate (CAS Number 6834-92-0)
- o. Sodium tripolyphosphate (CAS Number 7758-29-4)
- p. Polyglycols
- q. Urea (CAS Number 57-13-6)
- r. Propylene glycol (CAS Number 57-55-6)
- s. Iminoacetic acid (including ethylenediamine tetraacetic acid [EDTA])/ chelating agents

Shipboard sewage, in addition to the wastes listed above, may contain scale prevention products in accordance with MIL-PRF-32217. Graywater contains discarded water from deck drains, lavatories, showers, dishwashers, laundries, and garbage grinders, as well as discarded water from shipboard medical facilities (does not include industrial wastes, infectious wastes, and human body wastes).

3.1.2 Alternate materials. Alternate materials may be used for those materials specified herein provided these materials have greater corrosion resistance and improved physical and electrical qualities for the intended use than the materials specified.

3.2 Design and construction.

3.2.1 Design. Float arm magnet-actuated type liquid level switches shall employ opposing permanent magnets to activate electric switches located in a switch module. As the float module travels to its upper and lower limits, its magnet shall repulse a magnet located in the switch module (see figure 1). As the switch module's magnet is repulsed in either direction, it shall move a mechanical linkage in the switch module that in turn changes the settings of two independent electric switches.

3.2.2 Construction. Each liquid level switch assembly shall consist of a float module, float permanent magnet, flange module, and switch module.

3.2.2.1 Float module. The float module shall consist of a cylindrical float with the dimensions shown in figure 2, constructed of stainless steel alloy 316 Ti, and shall be capable of operating in fluids with 0.85 minimum specific gravity. A hole of sufficient size to accept fasteners for attachment to the float permanent magnet shall be provided.

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3.2.2.2 Float permanent magnet. The float permanent magnet (see figure 3) shall be provided with a stainless steel alloy 316 Ti shaft on one end with two holes of sufficient size to accept fasteners for attachment to the float module and flange module.

3.2.2.3 Flange module. The flange module shall be constructed of stainless steel alloy 316 Ti. The flange module shall be available in three mounting flange types with dimensions and drill patterns conforming to figures 4, 5, and 6.

3.2.2.3.1 Type I (regular flange). The flange shall include six evenly spaced drilled holes with the vertical plane of the float module-operating arc straddling the drilled holes (see figure 4).

3.2.2.3.2 Type II (special flange). The flange shall include six evenly spaced drilled holes with the vertical plane of the float module-operating arc passing through the center of the drilled holes (see figure 5).

3.2.2.3.3 Type III (square flange). For square mounting flanges, the flange shall include four drilled holes with the vertical plane of the float module-operating arc straddling the drilled holes (see figure 6).

3.2.2.4 Flange facing. The surface of the flange module in contact with the tank wall shall be a machined surface in accordance with ANSI B46.1 and with a finish with a circular lay (concentric) of 500 to 1000 roughness or (spiral) 125 to 500 produced by machining 30 to 80 serrations of uniform depth per inch of face width.

3.2.2.5 Flange linkage. Dual brackets (see figure 7) constructed of stainless steel alloy 317L shall be provided on the wet side of the flange module for attachment of the float permanent magnet.

3.2.2.6 Flange linkage cover. A cover constructed of stainless steel alloy 317L shall be provided on the wet side of the flange module that extends over the float permanent magnet and does not interfere with operation of the switch.

3.2.2.7 Flange boot. The open end of the flange linkage cover and float module shaft shall be fitted with a flexible synthetic rubber (Buna-N, shore hardness 40-50) boot to prevent liquids and solids from entering the linkage cavity. The boot shall not interfere with operation of the switch.

3.2.2.8 Miscellaneous hardware. Fasteners (e.g., pins and clips) used on the float side of the assembly shall be constructed of stainless steel alloy 317L.

3.2.2.9 Switch module. The switch module housing shall consist of the switch module enclosure and linkage/magnet cover. Both the switch module enclosure and linkage/magnet cover shall be constructed of seawater resistant die cast aluminum in accordance with European standard BS EN 1706 AC44300. Threaded fasteners shall be provided for securing the switch module enclosure and linkage/magnet cover to the flange module. The linkage/magnet cover shall be provided with gaskets where it mates with the switch module enclosure and flange module. The wiring connection at the bottom of the switch module enclosure shall be female, 3/4-inch NPT, Class 2A thread.

3.2.2.10 Switch module enclosure. The switch module enclosure shall contain a magnet, linkage, two independent electric switches, and a terminal board. A hinged cover constructed of seawater resistant die cast aluminum in accordance with BS EN 1706 AC44300 shall be provided on the end of the switch module that provides access to the terminal board. The enclosure shall be provided with a gasket where it mates with the linkage/magnet cover and threaded fasteners for securing the cover to the enclosure.

3.2.2.11 Marking. The outside of the switch module enclosure cover shall be permanently marked or labeled with the manufacturer's part number, company name, and address. The inside of the cover shall have a connection diagram (see figure 10) etched with "NO" (for Normally Open), "NC" (for Normally Closed), or C (for Common) designations for switch contacts or numbers assigned by the manufacturer.

3.2.2.12 Magnet and linkage. The switch module magnet shall be affixed to the switch module linkage using threaded fasteners and installed facing the flange module.

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3.2.2.13 Electric switches. The electric switches shall be single pole, double throw (SPDT) type micro switches with screw-type terminals, rated for 5 amps at 250 volts AC (VAC) with silver contacts in accordance with NEMA 4/Enclosure 13 rated or IP65 standards. Each switch's terminal contacts shall be marked "NO" (for Normally Open), "NC" (for Normally Closed), or "C" (for Common) (see figure 11); or graphically with symbols (see figure 12).

3.2.2.14 Wiring and terminal board. Wiring from the electric switches to the terminal board shall be constructed of solid, corrosion-resistant wire rated for a minimum of 5 amps. The terminal board shall be a surface-mounted, one-piece molded, barrier type terminal board with six screw-type terminals rated for a minimum of 5 amps. Each terminal connection shall be permanently marked NO, NC, or C, as applicable, or with numbers corresponding to those assigned by the manufacturer for the connection diagram etched on the inside cover.

3.3 Performance characteristics.

3.3.1 Environmental. The liquid level switch shall operate in the following environment:

3.3.1.1 Temperature. Liquid level switches shall operate in liquids with temperature variations from 40 to 160 °F, with no effect on switch operation.

3.3.1.2 Pressure. Liquid level switches and all wetted parts shall withstand and operate subjected to continuous external liquid pressure of 40 pounds per square inch or greater and without moisture intrusion, causing mechanical or electrical failures, or corrosion.

3.3.2 Voltage and frequency. Liquid level switches shall operate with input voltages of 115 VAC, 60 Hz single-phase power in accordance with DOD-STD-1399-300.

3.3.3 Service life. The liquid level switch shall be designed for not less than 48 months of trouble-free operation when installed aboard ship in a sewage or graywater environment (see 3.1.1).

3.3.4 Underwriters Laboratory Inc. (UL) certification. The liquid level switch assembly shall be examined and tested for conformance to UL 508 for use in water and sewage, and any other tests and inspections UL deems necessary for certification.

3.3.5 Operation.

3.3.5.1 Switch operation. Float arm magnet-actuated liquid level switches shall operate by movement of opposing magnets that activate electric switches. As the switch float rotates, the linkage attached to the float shall bring a magnet in close proximity to the non-magnetic surface of the switch flange. This shall allow a magnetic signal from the float magnet to be transmitted across the flange wall. This magnetic signal shall repulse a second magnet located on the linkage in the switch module since both magnets are positioned with like poles facing each other. The force of the repulsion on the second magnet shall cause the mechanical linkage in the switch module to move which in turn changes the settings of two independent electric switches.

3.3.5.2 Electric switch operation. Each electrical switch shall have one NO contact, one NC contact, and one C contact. NO contacts shall be open when the end of the float is $\frac{1}{32}$ inch below the horizontal plane and closed when the end of the float is $\frac{1}{32}$ inch above the horizontal plane (see figure 13). NC contacts shall be closed when the end of the float is $\frac{1}{32}$ inch below the horizontal plane and open when the end of the float is $\frac{1}{32}$ inch above the horizontal plane.

3.4 Workmanship. Liquid level switches shall be in accordance with the specifications herein, shall be without deformation or malfunction, and shall be clean and free of cracks and burrs. Surfaces of castings, forgings, molded parts, stampings, machined, and welded parts shall be clean and free from sand, dirt, sharp edges, scales, flux, and other harmful or extraneous materials. These surfaces shall also be free of defects such as porosity, under cuts, voids, and gaps. External surfaces shall be smooth and edges shall be either beveled or rounded.

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3.5 Metric products. Products manufactured to metric dimensions will be considered on an equal basis with those manufactured using inch-pound units provided they fall within the conversion requirements of IEEE 268 and all other requirements of this specification are met. If a product is manufactured to metric dimensions and those dimensions exceed the conversion limitations specified in IEEE 268 for inch/pound units, a request may be made to the Contracting Officer to determine if the product is acceptable. The Contracting Officer has the option of accepting or rejecting the product.

4. REGULATORY REQUIREMENTS. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

5. PRODUCT CONFORMANCE PROVISIONS.

5.1 Product conformance. The products provided shall meet the salient characteristics of this Commercial Item Description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The government reserves the right to require proof of such conformance.

5.2 Market acceptability. The item offered must have been sold to the government or commercial market. A modified commercial, off-the-shelf item may be used to minimize design and engineering risk. The offeror shall certify and provide supporting documentation as to the product's serviceability and the long-term (5 years) availability of all necessary maintenance and logistics support parts and materials.

5.3 Bid samples. When specified (see 7.3), one liquid level switch shall be submitted to the Government for examination and testing. The bid sample shall be non-returnable. Switch activation (see 5.4.3), shock (see 5.4.4), vibration (see 5.4.5), and EMI (see 5.4.6) testing shall be performed on the bid sample by the government, as applicable. Failure of the bid sample to meet the requirements of any of the applicable tests or examinations listed herein shall be cause for rejection of the bid. The manufacturer may perform bid testing; however, the government shall have the right to inspect the test facilities at the manufacture plant to witness all tests specified herein. All failures, deficiencies, and discrepancies revealed during the performance of the specified tests and the corrective measures taken shall be recorded and fully documented in the applicable test records and test reports. After correction of deficiencies, tests shall be repeated to the extent necessary to ascertain acceptability.

5.4 Inspection requirements.

5.4.1 Failure. Failure of any of the tests and examinations listed herein shall be cause for rejection.

5.4.2 Visual examination. The liquid level switch shall be visually examined to determine compliance with requirements of this description and with specified dimensions.

5.4.3 Switch activation test. When specified (see 7.3), the liquid level switch shall be mounted to a test rig fabricated to simulate a shipboard bulkhead (vertical wall) with a 3½-inch diameter opening and provided with ½-inch UNC studs to match the appropriate mounting flange drill pattern (see 3.2.2.3). The leads from each switch shall be connected to an electrical circuit with the characteristics described in 3.3.2. The float shall be allowed to hang downward by gravity and shall then be raised slowly upward. The normally open switch contacts shall activate (close) and the normally closed contacts shall deactivate (open) when the end of the float is 15/32 inch above the horizontal plane shown in figure 13. The float shall then be slowly lowered back down until the switch deactivates (opens) for a normally open switch and activates (closes) for a normally closed switch with the end of the float 15/32 inch below the horizontal plane. The exact operating points shall be during all phases of testing shall be recorded. The cycle shall be repeated 3 times. Failure to activate or deactivate 15/32 inch above and 15/32 inch below the horizontal plane for either switch shall constitute failure of the test. The exact rate at which the switches are cycled shall be at the manufacturer's discretion.

5.4.4 Shock test. When specified (see 7.3), the liquid level switch shall be shock tested in accordance with MIL-S-901 and meet the requirements for Grade B, Class I, Type A hull/deck mounted equipment. During shock testing the liquid level switch shall be mounted to simulate shipboard installations in an empty tank and shall not be restricted from normal operation and movement.

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5.4.5 Vibration test. When specified (see 7.3), the liquid level switch shall be subjected to Type I vibration testing in accordance with MIL-STD-167-1 while mounted in accordance with 5.4.3, and shall not be restricted from normal operation and movement. The liquid level switch shall not suffer any cracking of a switch casing, broken or detached part, nor any impairment of its proper operation as determined by the switch activation tests of 5.4.3 which shall be repeated after vibration test. During the test, the switch contacts shall be monitored as specified by Method 310 of MIL-STD-202. Normally open switch contacts shall not close and normally closed switch contacts shall not open while undergoing vibration testing.

5.4.6 Electromagnetic interference (EMI). When specified (see 7.3), the liquid level switch shall meet the following requirements of MIL-STD-461 for surface ships: CE101, RE102, CS101, RS101, and RS103 at frequency ranges of 14 KHz to 10 GHz, E-Field level 10 (volts/meter).

6. PACKAGING. Preservation, packing, and marking shall be as specified in the contract or order.

7. NOTES.

7.1 Part or identification number (PIN). The following part or identification numbering procedure is for government purposes and does not constitute a requirement for the contractor.

This example describes a part numbering system for CID A-A-59806.

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Switch type:	1 – Type I
	2 – Type II
	3 – Type III
EMI:	A – Required
	B – Not required
H.I. shock grade:	A – Not used
	B – Grade B
	C – No shock required

7.2 Source of documents.

7.2.1 European standards. European Standards are available from the British Standards Institution, BSI British standards, 389 Chiswick High Road, London, W4 4AL, United Kingdom, or online at <http://www.bsi-global.com>.

7.2.2 FAR. The Federal Acquisition Regulation may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 or online at <http://www.arnet.gov/far>.

7.2.3 Defense specifications and standards. Defense specifications and standards are available online at <http://assist.daps.dla.mil> or from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

7.2.4 IEEE. IEEE standards are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331 or online at www.ieee.org.

7.2.5 Naval Sea Systems Command (NAVSEA) publications. NAVSEA publications are available from the Naval Logistics Library, 5450 Carlisle Pike, Mechanicsburg, PA 17055 or online at <http://nll.ahf.nmci.navy.mil>.

7.2.6 NEMA. NEMA standards are available from the National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209 or online at www.nema.org.

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7.2.7 UL. UL standards are available from COMM 2000, 1414 Brook Drive, Downers Grove, IL 60515 or online at www.ul.com.

7.3 Ordering data. The contract or order should specify the following:

- a. CID document number, revision, and CID PIN.
- b. Product conformance provisions.
- c. Quantity required.
- d. Type of float switch (see 2).
- e. When bid samples are required (see 5.3).
- f. Requirements for information to be provided with manufacturer's bid, including but not limited to sketches, catalog sheets, or other documents (see 5.3).
- g. Switch activation testing, if required (see 5.4.3).
- h. H.I. shock testing, if required (see 5.4.4).
- i. Vibration testing, if required (see 5.4.5).
- j. EMI design and test requirements, if required (see 5.4.6).
- k. Packaging requirements (see 6).
- l. A copy of the installation and maintenance bulletin packed with each liquid level switch assembly.

7.4 National stock numbers (NSNs). The following is a list of NSNs assigned, which correspond to this CID. The list may not be indicative of all possible NSNs associated with this CID.

NSN	ITEM
6680-01-468-7292	AASPEC051 (Type I)
6680-01-492-1045	AASPEC12051 (Type II)
5930-01-497-5596	A01051E15 (Type III)

7.5 Sources of supply. Manufacturers, whose products are known to meet the requirements of this CID, are listed below. Competition is not limited to those products and manufacturers.

Models AASPEC 051, AASPEC12 051, A01051E15
 Granzow Inc.
 2300 Crown Point Executive Drive
 Charlotte, NC 28227-6702
 704-845-2300

7.6 Key words.

Arm, float
 Device, marine, sanitation
 Graywater
 MSD
 Switch, liquid, level
 System, sewage

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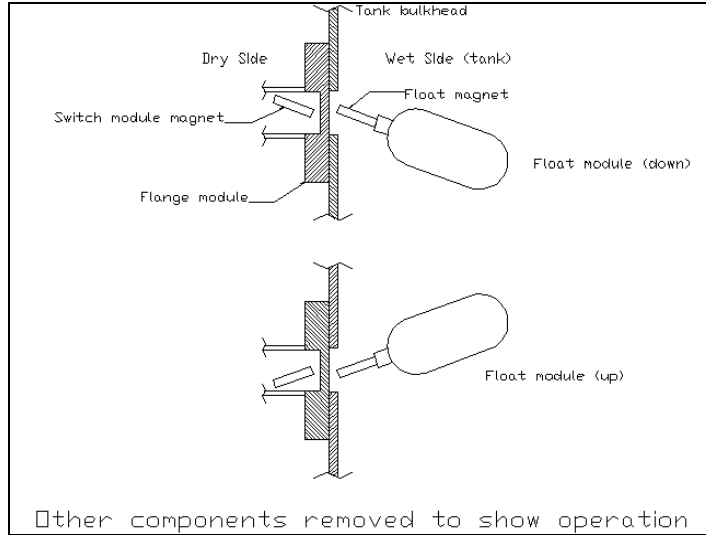


FIGURE 1. Switch module.

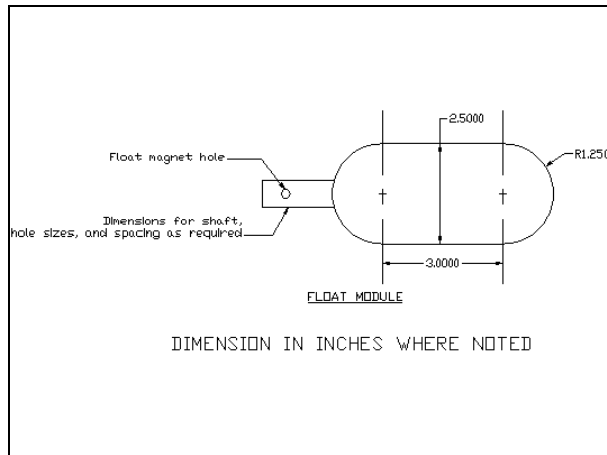


FIGURE 2. Float module.

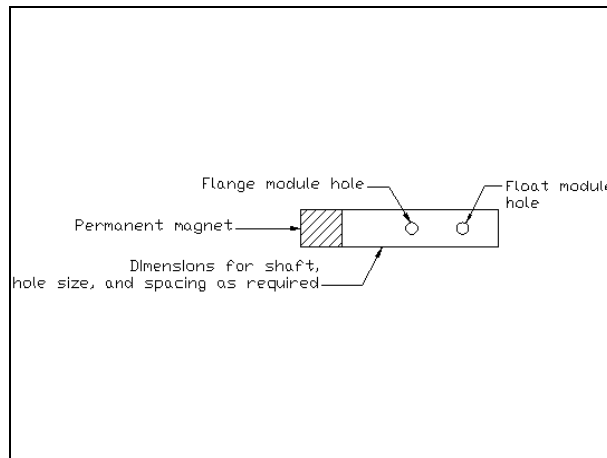


FIGURE 3. Float permanent magnet.

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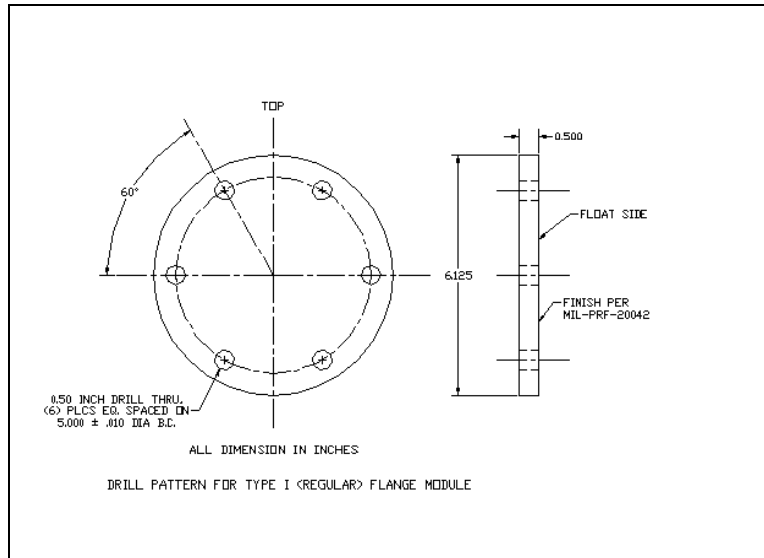


FIGURE 4. Drill pattern for Type I (regular) flange module.

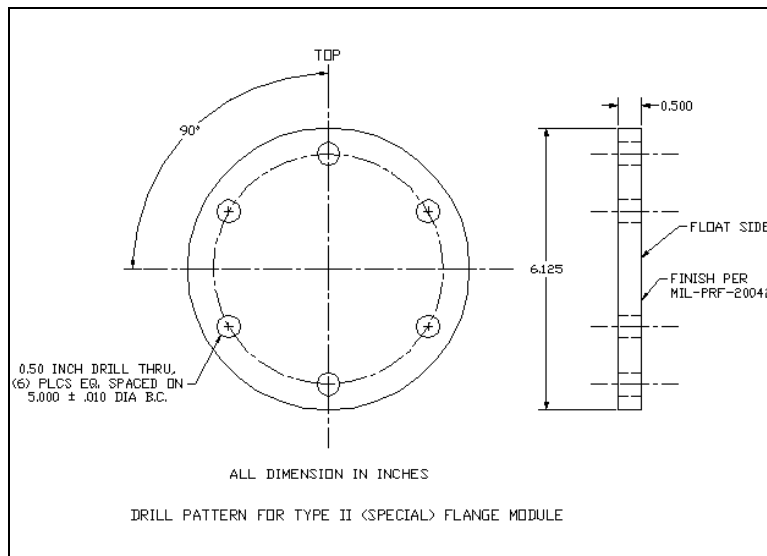


FIGURE 5. Drill pattern for Type II (special) flange module.

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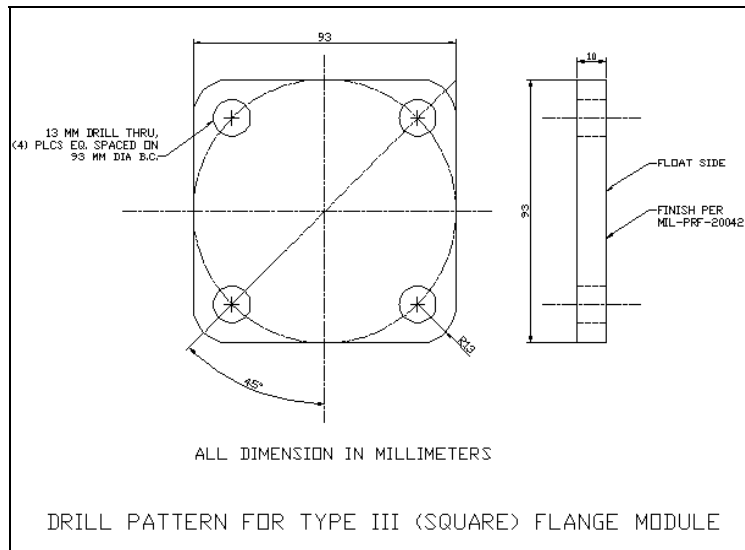


FIGURE 6. Drill pattern for Type III (square) flange module.

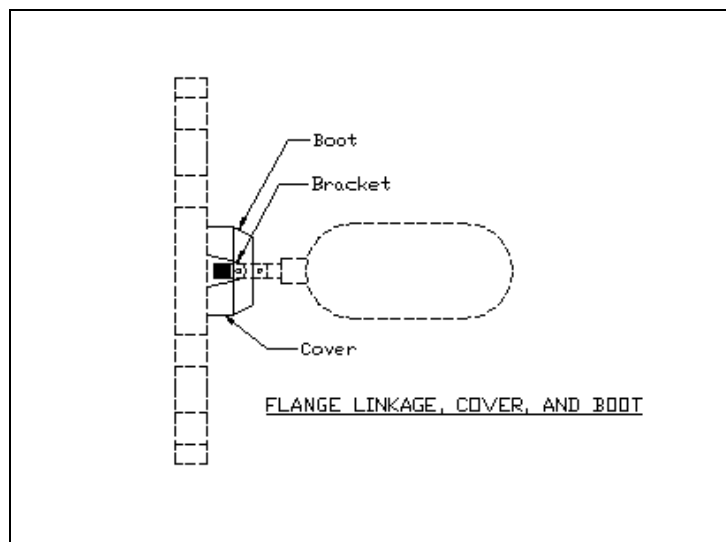


FIGURE 7. Flange linkage, cover, and boot.

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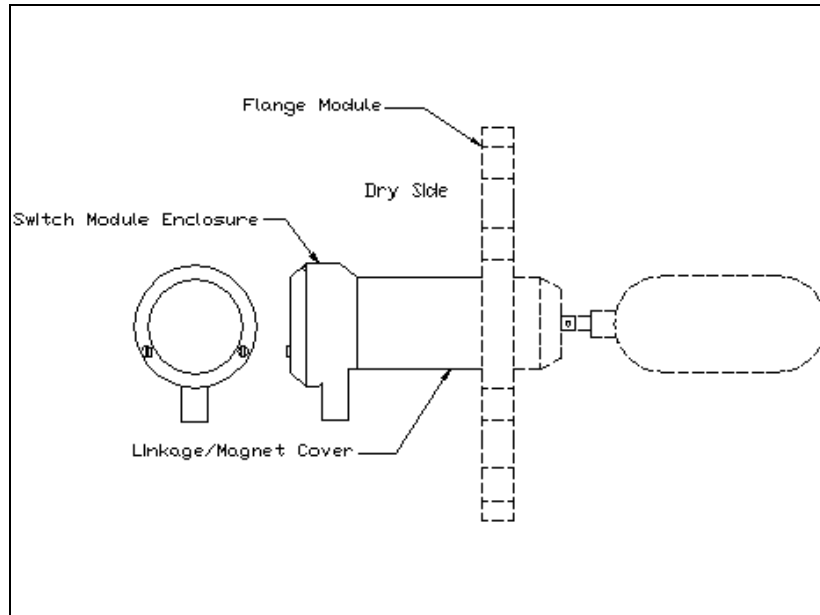


FIGURE 8. Switch module housing.

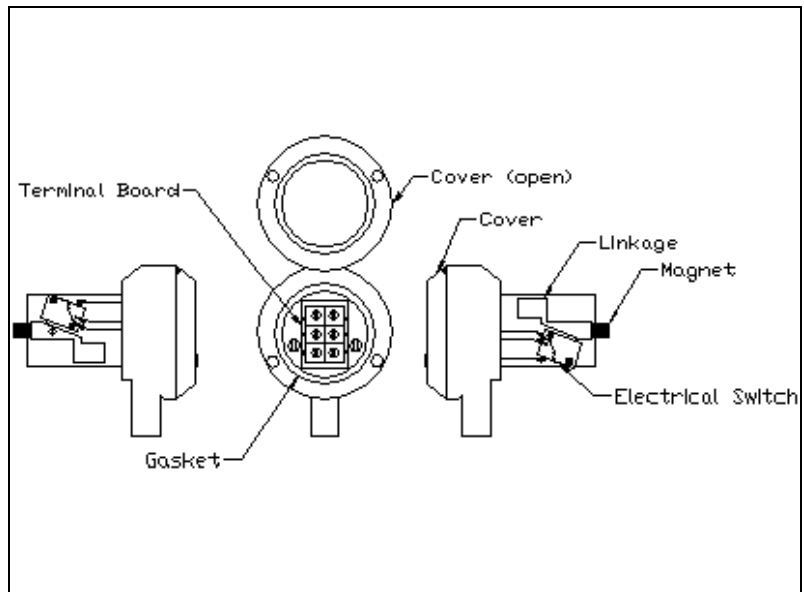


FIGURE 9. Switch module enclosure.

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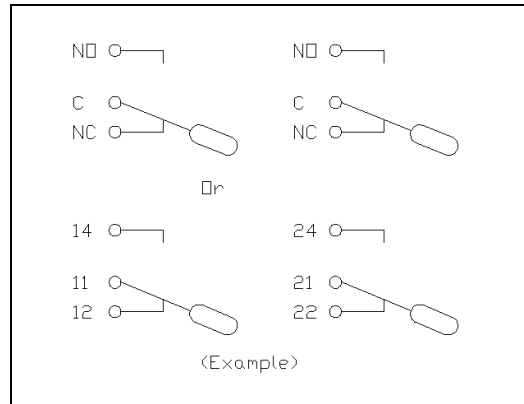


FIGURE 10. Marking.

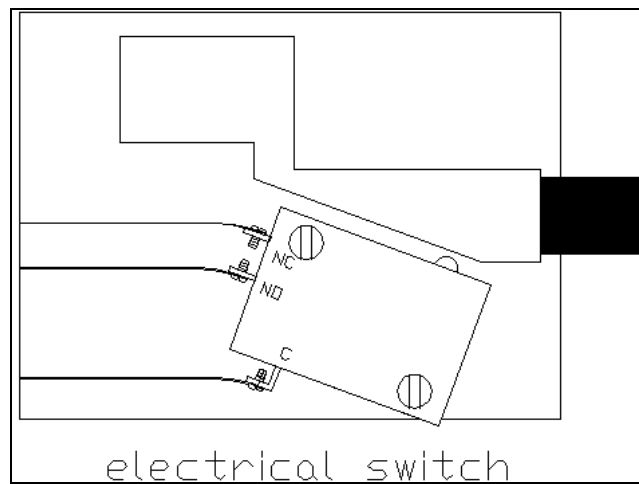


FIGURE 11. Electrical switch with NC, NO, C markings.

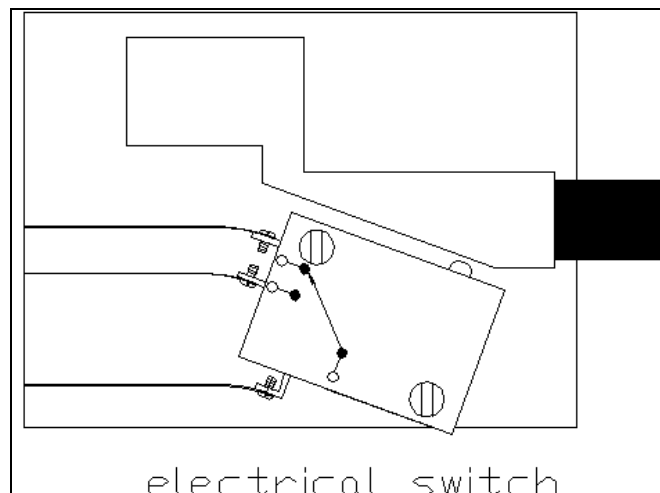
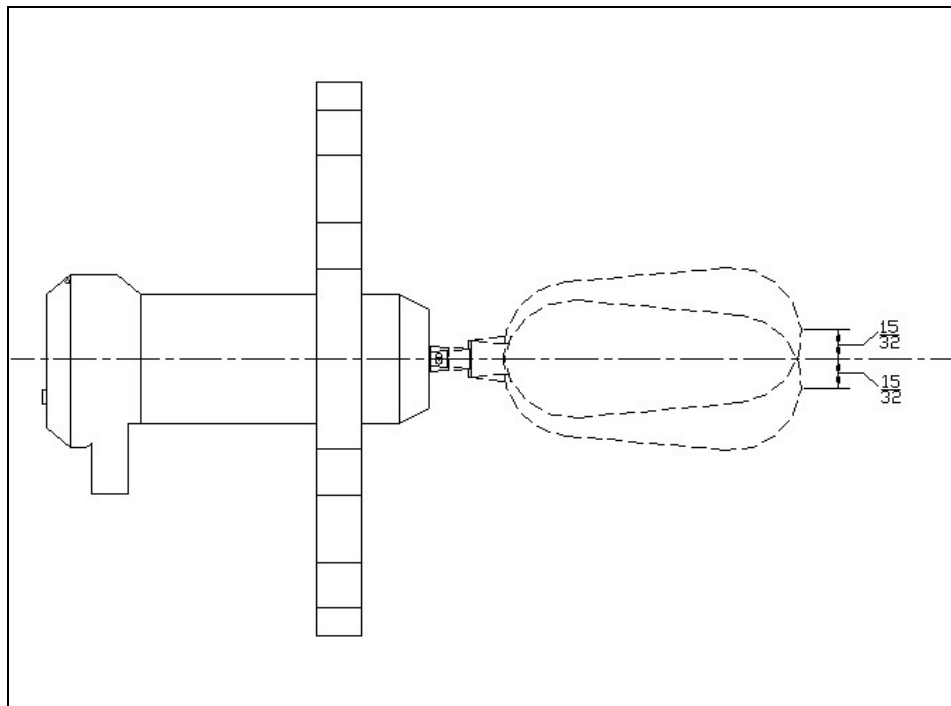


FIGURE 12. Electrical switch with graphic symbols.

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FIGURE 13. Electric switch operation.

MILITARY INTERESTS

Custodians:

Navy – SH
Air Force – 99

Review Activities:

Navy – AS
Air Force – 03, 11, 33, 71
DLA – GS, GS1
CIV – NIH

CIVIL AGENCY COORDINATING ACTIVITY:

GSA – FSS

Preparing Activity:

Navy – SH
(Project 6680-2007-002)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.