

Introduction

GO™ Switches operate on the principle of magnetic attraction, reacting to ferrous metal or magnetic targets as they come within the switch's sensing range.

Although switches vary in design according to their intended applications, all GO™ Switches use permanent magnets which, when actuated by the presence of a ferrous or magnetic target, change the state of electrical contacts.

Mounting

- 70 Series GO™ Switches are unaffected by weld fields and RF interference.

- 70 Series GO™ Switches may be mounted adjacent to or surrounded by ferrous metals however the proximity of ferrous metals will affect sensing distance. For the maximum rated sensing distance, avoid mounting near ferrous metals.

- GO™ Switches sense ferrous materials such as mild steel, 400 series and 17/4 stainless steel.

- Sensing and differential of switch may vary depending on target travel direction.

- Avoid contact between target and switch. Configure mounting of switch and/or target so that target passes within the sensing area. Sensing range will vary according to model number and mass of target used.

-Target magnets, available through TopWorx, will increase the sensing range of the switch. Reference sensing ranges in corresponding sections throughout the catalog.

-For optimum performance, provide sufficient mass of target, and choose the appropriate GO™ Switch model to match the application requirements for operating frequency, type of load, etc.

- Greater target mass and target movement fully into and out of sensing range will increase contact pressure. This is helpful in low current controls applications.

- For heavy or inductive loads, arc suppression devices, or interposing relays are recommended for contact longevity. Contact factory for specifics.

- Do not use excessive force on external threads when installing. For typical installations: Torque 3/8" threads to 60lbs-in (7 N-m) max. Torque 5/8" threads to 35 lbs.-ft. (47 N-m) max. Consult TopWorx technician for special installations.

- Configure mounting so bracket dissects switch as close to the middle of the body as possible. This eliminates undue stress caused by heavy cables, connectors, etc.

- Two appropriately sized jam nuts are included with switch. Lock washers are recommended where vibration is present.

Specifications - SPDT

Sensing Distance:
71 & 72: .040" (1.02mm) 2,000 PSI
73-77, 7L: .100" (2.54mm) 2,000 PSI
73-77: .072" (1.83mm) 5,000 PSI
73-77: .060" (1.52mm) 10,000 PSI

Range with Target Magnet:
 Up to .35" (Model 71 & 72 up to .15")

Differential:
 Approx. .020" (.5mm)

Thread Options:
71-77: 3/8-24 UNF; M12 x 1
73-76, 7L: 5/8-18 UNF; M18 x 1

Response time:
 8 milliseconds

Temperature Rating:
71-77: -40°F (-40°C) to 221°F (105°C) Std.*
71-77, 7G, 7H: HiTemp option to 400°F (204°C)*
7L: -40°F (-40°C) to 160°F (71°C)*
 * Reference certificates for variations to temperature rating.

Contact Material:
 Palladium silver with Sawtooth surface configuration

Contacts:
 Single Pole, Double Throw, Form C



Electrical Ratings: Resistive 71-77:
 4A @ 120VAC/3A @ 24VDC
 2A @ 240 VAC/1.25A @ 48VDC

7L:
 .25A @ 120VAC/24VDC (approx. 5V drop)

Target Material:
 Ferrous metal; optional target magnets

Conduit Outlet:
 1/2" -14NPT. One location

Enclosure Material:
 Stainless steel type 303, 316 optional;
 7L - 316 stainless steel

Repeatability:
 .002" (0.05mm) Under identical operating conditions

Specifications - DPDT

Sensing Distance:
 .090" (2.3mm) end sensing (2000 PSI)

Range with Target Magnet:
 up to .20" (5mm)

Differential:
 Approx. .020"(.5 mm)

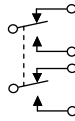
Thread Option:
7G, 7H: 5/8"-18 UNF; M18 x 1
7L: 1"-14 UNF

Response time:
 8 milliseconds

Temperature Rating:
 -40°F (-40°C) to 221°F (105°C)*
 HiTemp option to 400°F (204°C)*
 * Reference certificates for variations to temperature rating.

Contact Material:
 Palladium silver with Sawtooth surface configuration

Contacts:
 Double Pole Double Throw, 2 Form C.



Electrical Ratings: Resistive 71-77:
 3A @ 120VAC/1A @ 24VDC

Target Material:
 Ferrous metal; Optional target magnets

Enclosure Materials:
 Stainless Steel type 303, 316 optional

Conduit Outlet:
 1/2"-14 NPT. One location

Repeatability:
 .002" (0.05mm) typical under identical operating conditions

Setting Up A 70 Series GO™ Switch For Optimum Performance

GO™ Switch 70 Series end sensing switches use three permanent magnets and a push-pull plunger to control a set of mechanical contacts. The center magnet simultaneously attracts the primary magnet and repels the bias magnet, pushing the connecting rod and common contact into the normally closed position, closing a contact circuit. When a ferrous or magnetic target enters the sensing area of the switch, it attracts the primary magnet, which pulls the connecting rod and common contact. The normally closed and normally open contacts change state.

The **sensing distance** is the maximum distance between the switch and target when the switch first operates; the trip point. The **differential**, also known as deadband or hysteresis, is the distance that the target must move from the sensing area in order to allow the switch to reset.

To apply the 70 Series GO™ Switch and obtain the least differential, the direction the target approaches the switch must be considered. Below are two possible orientations that illustrate the differences in target movement and the affects on switch differential.

The measurements shown are nominal and can vary as much as .030-.050" depending on the material and size of target used in the application. As you can see, the best scenario for least differential is to orient the switch and target as shown in **Orientation B**. However, in this application, the possibility of getting debris between the switch and target must also be considered.

When trying to determine differential of an application, it is directly proportional to the distance the target will travel in the application. For example: a linear valve stroke is 1". A switch is applied to indicate the closed position of the valve. Using **Orientation A**, the differential is 0.090 ". The 'deadband' is therefore 9% of travel. If the switch were re-oriented, as shown in the **Orientation B**, the deadband would be only 2% of the total valve travel.

Remember, there is no exact science to use when applying a GO™ Switch. However, once the switch is set, and the target travels to the same position every time (within .002"), the GO™ Switch will maintain calibration for life. **Set it and forget it!**

Attachment of Conduit or Cable

- Attach conduit or cable correctly.
- When using long runs of conduit or cable, place supports close to the switch to avoid pulling switch out of position.
 - If switch is mounted on a moving part, be sure flexible conduit is long enough to allow for movement, and positioned to eliminate binding or pulling.
 - For installation in hazardous locations, check local electrical codes.
 - All conduit connected electrical devices, including GO™ Switches, must be sealed against water ingress through the conduit system. In figure 1, something common has occurred, the conduit system has filled with water. Over a period of time this may cause the switch to fail prematurely. In figure 2, the termination of the switch has been carefully filled with electronics grade RTV to prevent water ingress and to prevent premature switch failure. A drip loop with provision for water to escape has also been installed.

For hazardous locations install per Electrical Code. Dry contact devices, such as GO™ Switch, maybe installed intrinsically safe with matched barrier. When installed as explosion proof, lead seal fittings required within 18" of switch.



Figure 1. Incorrect

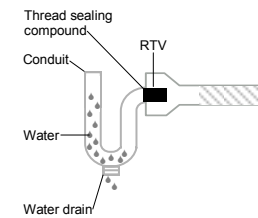


Figure 2. Correct

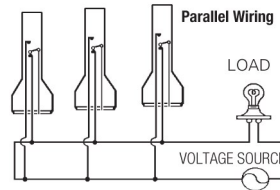
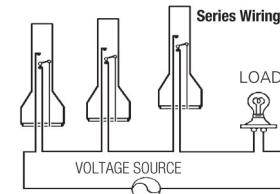
All GO™ Switches are "pure" contact switches, meaning they have no voltage drop when closed, nor do they have any leakage current when open. For multi-unit installation, switches may be wired in series or parallel, as shown below.

Series Wiring

Any number of GO™ Switches may be wired in series, without voltage drop. By contrast, solid state switches have about two volts drop across the switch when operated. In a 12 volt solid state system with four switches in series, 8 volts is dropped across the switches. Only 4V is left to operate the load. When using GO™ Switches, 12V is still available to operate the load. (Except 7L - approx. 5V drop)

Parallel Wiring

When solid state switches are placed in parallel, there is about 100 microamps leakage through each switch. If ten solid state switches were wired in parallel, the total leakage current would be 1000 microamps or one milliamp - sufficient current to indicate an "ON" condition to a programmable logic controller (PLC). **Any number of GO™ Switches may be wired in parallel, with no current leakage and without drawing operating current.** (Except 7L - approx. 5V drop)



Air and Hydraulic Cylinders

A ferrous cylinder cushion or piston will actuate the switch. To determine the correct thread length, measure the distance from the head cap surface to the cushion and add 1/2" for seal nut.

Thread seal nut onto switch. Screw switch into cylinder by hand until switch touches cushion. Back out 1/4 to 1/2 turn. Tighten seal nut.

Cylinder Applications Switch Sealing Torque Values

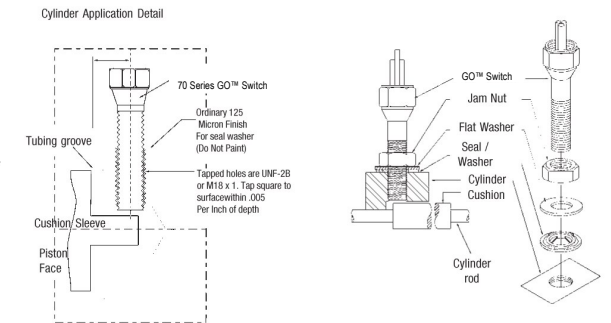
Models 71-72:
 3/8" Diam/12mm

Torque Jam Nuts to:
 15 lbs-in to achieve seal at 2,000 PSI
 30 lbs-in to achieve seal at 5,000 PSI
 Do not exceed 60lbs.-in (7N-m)

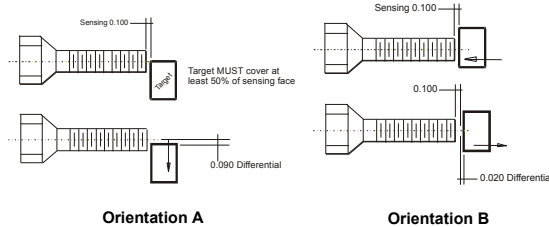
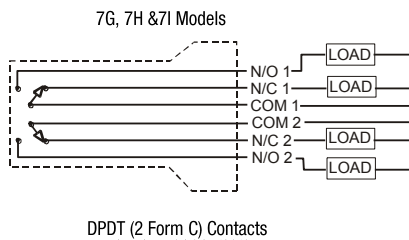
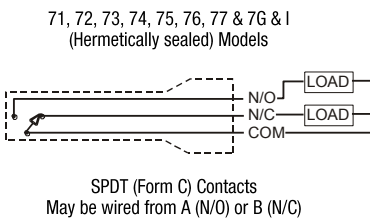
Models 73-76 & 7L:
 5/8" Diam/18mm

Torque Jam Nuts to:
 15 lbs-ft to achieve seal at 2,000 PSI
 25 lbs-ft to achieve seal at 5,000 PSI
 Do not exceed 35lbs.-ft (47 N-m)

FOR ADDITIONAL INFORMATION, SEE BULLETIN S-K037.



GO™ Switch Hook-Up Diagrams



EC Declaration of Conformity

The products described herein, conform to the provisions of the following European Community Directives, including the latest amendments:

- Low Voltage Directive (2006/95/EC)
- EMC Directive (2004/108/EC)
- Machinery Directive (2006/42/EC)
- ATEX Directive (94/9/EC).

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Wiring Diagrams 70 Series– SPDT

Termination A&F

3 Wire PVC & HiTemp Leads	
N/C	Red
N/O	Blue
COM	Black

4 Wire PVC & HiTemp Leads	
N/C	Red
N/O	Blue
COM	Black
GND	Green

4 Conductor PVC Cable	
N/C	Red
N/O	White
COM	Black
GND	Green

Termination N (74 Switch only)

N/C	Wire 3
N/O	Wire 2
COM	Wire 1
GND	Yellow/Green

Termination DBD

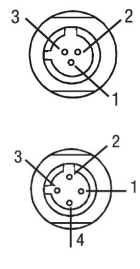
Micro-Change QDC - 3 Pin	
Pin 1	COM
Pin 2	N/C
Pin 3	N/O

Micro-Change QDC - 4 Pin	
Pin 1	COM
Pin 2	N/O
Pin 3	N/C
Pin 4	GND

Termination B

3 Conductor PVC Cable	
N/C	Red
N/O	White
COM	Black

Mini-Change QDC - 3 Pin	
Pin 1	COM
Pin 2	N/C
Pin 3	N/O



Mini-Change

Termination DCG

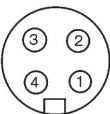
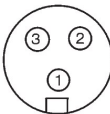
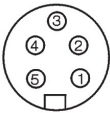
Mini-Change QDC - 5 Pin	
Pin 1	N/O
Pin 2	N/C
Pin 3	GND
Pin 4	Inactive
Pin 5	COM

Termination DCA

Mini-Change QDC - 3 Pin for 7L	
Pin 1	COM
Pin 2	N/C
Pin 3	N/O

Termination DCD

Mini-Change QDC - 4 Pin	
Pin 1	COM
Pin 2	N/O
Pin 3	N/C
Pin 4	GND



SubSea

Termination 3DD

SubSea - 3 Pin - Lock Sleeve	
Pin 1	N/C
Pin 2	COM
Pin 3	N/O

Termination 3DE

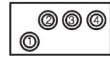
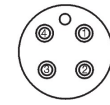
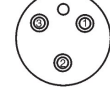
SubSea - 3 Pin - Right Angle	
Pin 1	COM
Pin 2	N/O
Pin 3	N/C

Termination 4DD

SubSea - 4 Pin - Lock Sleeve	
Pin 1	COM
Pin 2	N/O
Pin 3	N/C
Pin 4	GND

Termination 4DE

SubSea - 4 Pin - Right Angle	
Pin 1	COM
Pin 2	N/O
Pin 3	N/C
Pin 4	GND



Wiring Diagrams 7G, 7H, 7I– DPDT

PVC Leads, Cable & Teflon Leads

N/C1 - Red	N/C2 - Red/White Strp
N/O1 - Blue	N/O2 - Blue/White Strp
COM1 - Black	COM2 - Black/White Strp
GND - Green	

Termination DCH

Mini-Change QDC - 7 Pin	
Pin 1	N/O ₂
Pin 2	COM ₁
Pin 3	N/C ₂
Pin 4	N/C ₁
Pin 5	COM ₂
Pin 6	N/O ₁
Pin 7	GND



Special Conditions for Safe Use and Possible Misuse

-The oversheathed or individual conductors must be suitably protected against mechanical damage and terminated within a terminal or junction facility suitable for the conditions of use.

-Three wire/three pin devices are not provided with an external connection facility for the earthing or bonding conductor. It is the user's responsibility to ensure adequate earth continuity via the mounting arrangements.

-Both contacts of the Double Throw and the separate poles of the Double Pole switch, within one proximity switch must form part of the same intrinsically safe circuit.

-The proximity switches do not require a connection to earth for safety purposes, but an earth connection is provided which is directly connected to the metallic enclosure. Normally an intrinsically safe circuit may be earthed at one point only. If the earth connection is used, the implications of this must be fully considered in any installation. i.e. by the use of a galvanically isolated interface.

-The switch must be supplied from a Certified Ex ia IIC intrinsically safe source.

-The flying leads must be terminated in a manner suitable for the zone of installation.

-An external ground connection must be protected by an external mounting device and / or cable connections / conduits.

-For 74 Series switch, temperature and environmental temperature are marked T6 / T85 ° C (-20 ° C ≤ Ta ≤ +50 ° C).

TOPWORX TERMS AND CONDITIONS OF SALE

These terms and conditions, the attendant quotation or acknowledgment, and all documents incorporated by reference therein, binds TopWorx, Inc. hereinafter the Seller, and the buyer, hereinafter Buyer, and constitutes the entire agreement (Agreement) between Buyer and Seller for the provision of services (Services) and/or the sale of goods (Goods) including (except as provided in Section 10) firmware incorporated therein.

1. PRICES: Unless otherwise specified by Seller, Seller's price for the Goods and/or Services shall remain in effect for thirty (30) days after the date of Seller's quotation or acceptance of the order for the Goods/Services, whichever is delivered first, provided an unconditional, complete authorization for the immediate manufacture and shipment of the Goods and/or provision of Services pursuant to Seller's standard order processing procedures is received and accepted by Seller within such time period. If such authorization is not received by Seller within such thirty (30) day period, Seller shall have the right to change the price for the Goods/Services to Seller's price in effect for the Goods/Services at the time the order is released to final manufacture. Prices for Goods do not cover storing, installing, starting up or maintaining Goods unless expressly stated in Seller's quotation. Notwithstanding the foregoing, the price for Goods/Services sold by Seller, but manufactured by others, shall be Seller's price in effect at the time of shipment to Buyer.

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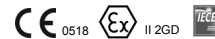
8. TAXES: Any tax or governmental charge payable by the Seller because of the manufacture, sale or delivery of the Goods, or provision of Services, may at Seller's option be added to the price herein specified. The foregoing shall not apply to taxes based upon Seller's net income.

9. TERMS OF PAYMENT: Subject to the approval of Seller's Credit Department, terms are F.O.B. shipping point, net 30 days from date of Seller's invoice in U.S. currency, except for applicable milestone payments covered below or export shipments for which Seller may require other arrangements. Freight charges may include shipping and handling charges, and Buyer shall pay all such charges. If any payment owed to Seller hereunder is not paid when due, it shall bear interest at a rate 1-1/2% per month interest from the date on which it is due until it is received and future shipments may be placed on hold. Seller shall have the right, among other remedies, either to terminate the Agreement or to suspend further deliveries under this and/or other agreements with Buyer in the event Buyer fails to make any payment hereunder when due. Buyer shall be liable for all expenses attendant to collection of past due amounts, including attorneys' fees. Unless otherwise provided in Seller's written quotation, periodic milestone payments shall be made by Buyer when the purchase price of this Agreement exceeds \$100,000. In such cases, invoices shall be issued by Seller and paid by Buyer based on the following milestones: Milestone 1: 30% of price upon acceptance of order by Seller. Milestone 2: 30% of price upon release by Seller of approved bills of material to manufacturing for assembly. Milestone 3: 40% of price upon shipment of the Goods by Seller. Seller reserves the right to designate additional Milestones where the Agreement provides for Services in excess of \$50,000.

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11. BUYER SUPPLIED DATA: To the extent that Seller has relied upon any specifications, information, representation of operating conditions or other data or information supplied by Buyer to Seller ("Data") in the selection or design of the Goods and/or provision of the Services and the preparation of Seller's quotation, and in the event that actual operating conditions or other conditions differ from those represented by Buyer and relied upon by Seller, any warranties or other provisions contained herein which are affected by such conditions shall be null and void.

12. EXPORT/IMPORT: Buyer agrees that all applicable import and export control laws, regulations, orders and requirements, including without limitation those of the United States and the European Union, and the jurisdictions in which the Seller and Buyer are established or from which items may be supplied will apply to its receipt and use of Goods and Services. In no event shall Buyer use, transfer, release, import, export, or re-export Goods in violation of such applicable laws, regulations, orders, or requirements.

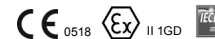


Ex d IIC T6 Gb, Ex tb IIIC T85°C (Tamb = -40°C to +50°C)
 Ex d IIC T4 Gb, Ex tb IIIC T135°C (Tamb = -40°C to +100°C)
 Ex d IIC T3 Gb, Ex tb IIIC T200°C (Tamb = -40°C to +150°C)
 IBaseefa08ATEX0360X
 ECEx BAS 08.0122X
 120VAC/4A AND 24VDC/3A FOR SPDT SWITCHES
 120VAC/3A AND 24VDC/1A FOR DPDT SWITCHES



Ex d IIC T6 Gb, Ex tb IIIC T85°C Db IP66 (-40°C ≤ Ta ≤ +50°C)
 Ex d IIC T4 T3 Gb, Ex tb IIIC T135°C/T200°C Db IP66 (-40°C ≤ Ta ≤ +100°C/150°C)

For 74 Series Nitrox cable only:
 Ex d IIC T6 Gb, Ex tb IIIC T85°C Db IP66 (-20°C ≤ Ta ≤ +50°C)
 NCC 12.1268X



Ex ia IIC T6 Ga, Ex ia IIIC T85°C Da (Tamb = -40°C to +50°C)
 Ex ia IIC T4 Ga, Ex ia IIIC T135°C Da (Tamb = -40°C to +100°C)
 Ex ia IIC T3 Ga, Ex ia IIIC T200°C Da (Tamb = -40°C to +150°C)
 Baseefa09ATEX0173X
 IECEx BAS 09.0080X
 Ui = 30V and Ii = 250mA

Reference Baseefa Certificate for special conditions. All area classifications are dictated by the model number. Reference GO™ Switch brochure for complete listing.



For 7L Series with "E" approval the following statements apply:
 - This equipment is suitable for use in Class I, Division 2, Groups A, B, C & D, Class II, Division 2, Groups F&G and Class III or non-hazardous locations only.
 - **Warning-Explosion Hazard**- Substitution of components may impair suitability for Class 1, Division 2.
 - **Warning-Explosion Hazard** - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

13. GENERAL PROVISIONS: (a) Buyer shall not assign its rights or obligations under the Agreement without Seller's prior written consent; (b) there are no understandings, agreements or representations, express or implied, not specified in the Agreement; (c) no action, regardless of form, arising out of transactions under the Agreement, may be brought by either party more than two years after the cause of action has accrued; (d) any modification of these terms and conditions must be set forth in a written instrument signed by a duly authorized representative of Seller; (e) the Agreement is formed and shall be construed, performed and enforced under the laws of the State of Missouri (however, Buyer and Seller agree that the proper venue for all actions arising under the Agreement shall be only in the State where the Goods involved in such actions were manufactured; (f) The 1980 United Nations Convention on Contracts for the International Sale of Goods does not apply to this Agreement; (g) If any provision of the Agreement is invalid under any statute or rule of law, such provision, to that extent only, shall be deemed to be omitted without affecting the validity of the remainder of the Agreement; (h) Seller specifically objects to the application of any Federal Acquisition Regulation ("FAR") or other governmental procurement provision or clause to the Agreement; (i) UNLESS OTHERWISE SPECIFICALLY PROVIDED IN SELLER'S QUOTATION, GOODS AND SERVICES HEREUNDER ARE NOT INTENDED FOR USE IN ANY NUCLEAR OR NUCLEAR RELATED APPLICATIONS. Buyer (i) accepts Goods and Services in accordance with the restriction set forth in the immediately preceding sentence, (ii) agrees to communicate such restriction in writing to any and all subsequent purchasers or users and (iii) agrees to defend, indemnify and hold harmless Seller from any and all claims, losses, liabilities, suits, judgments and damages, including incidental and consequential damages, arising from use of Goods and Services in any nuclear or nuclear related applications, whether the cause of action be based in tort, contract or otherwise, including allegations that the Seller's liability is based on negligence or strict liability; (j) The rights, remedies and protections afforded to Seller under this Agreement, including but not limited to indemnification of Seller, limitation of remedy and liability and limited warranty shall extend to Seller and to its affiliates, subsidiaries, or related companies performing or supplying work, services, or products under this Agreement or any agreement into which it is incorporated by reference; and (k) Seller does not agree to: (i) indemnify Buyer; or (ii) name Buyer as an additional insured.