



# INSTRUCTION MANUAL

## SIL 2 Switch/Proximity Detector Repeater Transistor Out, DIN-Rail and Termination Board, Models D6037S, D6037D



## Characteristics

**General Description:** The single and dual channel Switch/Proximity Detector Repeater, D6037S and D6037D module is a unit suitable for applications requiring SIL 2 level (according to IEC 61508:2010 Ed. 2) in safety related systems for high risk industries.

The unit can be configured for switch or proximity detector (EN60947-5-6, NAMUR), NO or NC and for NO or NC optocoupled open collector transistor output.

Each channel enables a load to be controlled by a switch, or a proximity detector.

A fault detection circuit (DIP switch enabled) is available for both proximity sensor and switch equipped with end of line resistors. In case of fault, when enabled, it de-energizes the corresponding output transistor and turns the fault LED on; when disabled the corresponding output transistor repeats the input line open or closed status as configured.

Mounting on standard DIN-Rail, with or without Power Bus, or on customized Termination Boards.

### Functional Safety Management Certification:

G.M. International is certified by TÜV to conform to IEC61508:2010 part 1 clauses 5-6 for safety related systems up to and included SIL3.



## Technical Data

**Supply:** 24 Vdc nom (18 to 30 Vdc) reverse polarity protected, ripple within voltage limits  $\leq 5$  Vpp, 2 A time lag fuse internally protected.

**Current consumption @ 24 V:** 22 mA for 2 channels D6037D, 12 mA for 1 channel D6037S with short circuit input and transistor closed, typical.

**Power dissipation:** 0.53 W for 2 channels D6037D, 0.30 W for 1 channel D6037S with 24 V supply voltage, short circuit input and transistor closed, typical.

**Isolation (Test Voltage):** In/Out 1.5 kV; In/Supply 1.5 kV; In/In 500 V; Out/Supply 500 V; Out/Out 500 V.

**Input switching current levels:** ON  $\geq 2.1$  mA (1.9 to 6.2 mA range), OFF  $\leq 1.2$  mA (0.4 to 1.3 mA range), switch current  $\approx 1.65$  mA  $\pm 0.2$  mA hysteresis.

**Fault current levels:** open fault  $\leq 0.2$  mA, short fault  $\geq 6.8$  mA.

**Input equivalent source:** 8 V 1 k $\Omega$  typical (8 V no load, 8 mA short circuit).

**Output:** voltage free SPST optocoupled open-collector transistor.

**Open-collector rating:** 100 mA at 35 Vdc ( $\leq 1.5$  V voltage drop).

**Leakage current:**  $\leq 50$   $\mu$ A at 35 Vdc.

**Response time:**  $\leq 100$   $\mu$ s.

**Frequency response:** 5 kHz maximum.

### Compatibility:



CE mark compliant, conforms to Directive: 2014/30/EU EMC, 2014/35/EU LVD, 2011/65/EU RoHS.

### Environmental conditions:

**Operating:** temperature limits  $-40$  to  $+70$  °C, relative humidity 95 %, up to 55 °C.

**Storage:** temperature limits  $-45$  to  $+80$  °C.

### Approvals:



TÜV Certificate No. C-IS-722134640-01, SIL 2 conforms to IEC61508:2010 Ed.2.

SIL 3 Functional Safety TÜV Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.

### Mounting:

T35 DIN-Rail according to EN50022, with or without Power Bus or on customized Termination Board.

**Weight:** about 125 g D6037D, 110 g D6037S.

**Connection:** by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm<sup>2</sup>.

**Protection class:** IP 20.

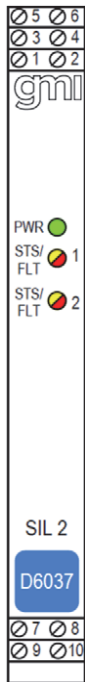
**Dimensions:** Width 12.5 mm, Depth 123 mm, Height 120 mm.

## Ordering Information

Model:	D6037	
1 channel		S
2 channels		D

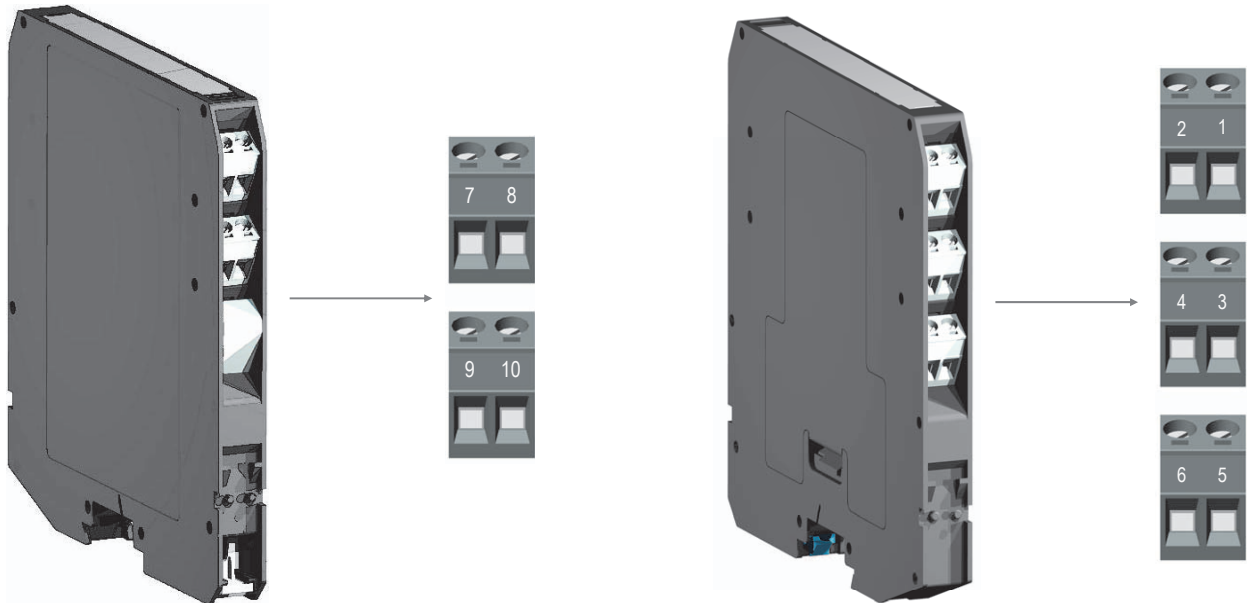
Power Bus and DIN-Rail accessories:  
 Connector JDFT049 Cover and fix MCHP196  
 Terminal block male MOR017 Terminal block female MOR022

## Front Panel and Features



- SIL 2 according to IEC 61508:2010 Ed. 2 for Tproof = 8 / 20 years ( $\leq 10\%$  /  $>10\%$  of total SIF) for D6037S and D6037D.
- PFDavg (1 year) 1.21 E-04, SFF 77.15 % for D6037S.
- PFDavg (1 year) 1.21 E-04, SFF 78.15 % for D6037D.
- Systematic capability SIL 3
- NO/NC switch/proximity Detector Input, NO/NC transistor driving mode.
- Field open and short circuit detection.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.
- In-field programmability by DIP Switch.
- TÜV Certification.
- TÜV Functional Safety Certification.
- High Density, two channels per unit.
- Simplified installation using standard DIN-Rail and plug-in terminal blocks, with or without Power Bus, or customized Termination Boards.

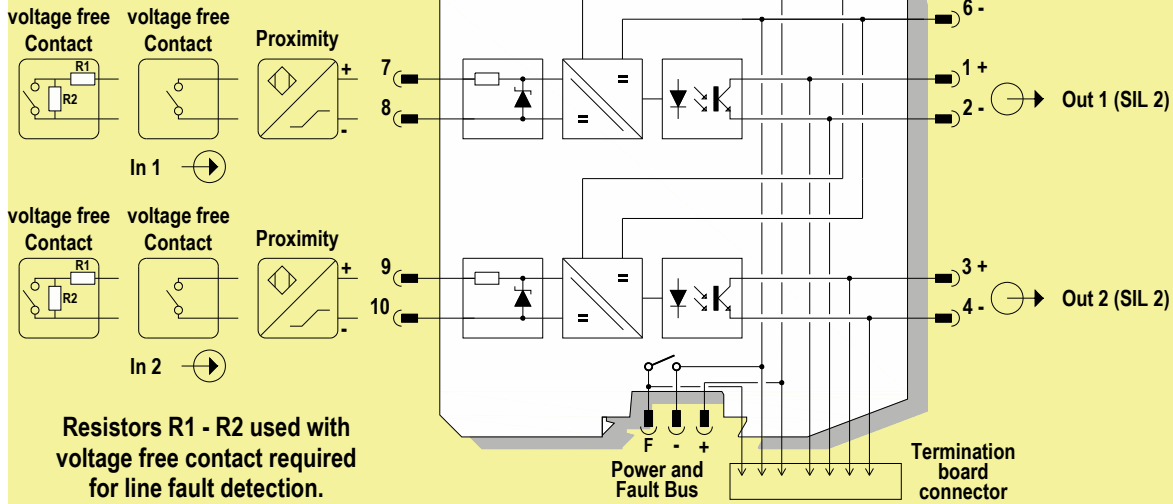
## Terminal block connections



- |           |                                                    |
|-----------|----------------------------------------------------|
| <b>7</b>  | + Input Ch 1 for Proximity or Voltage free Contact |
| <b>8</b>  | - Input Ch 1 for Proximity or Voltage free Contact |
| <b>9</b>  | + Input Ch 2 for Proximity or Voltage free Contact |
| <b>10</b> | - Input Ch 2 for Proximity or Voltage free Contact |

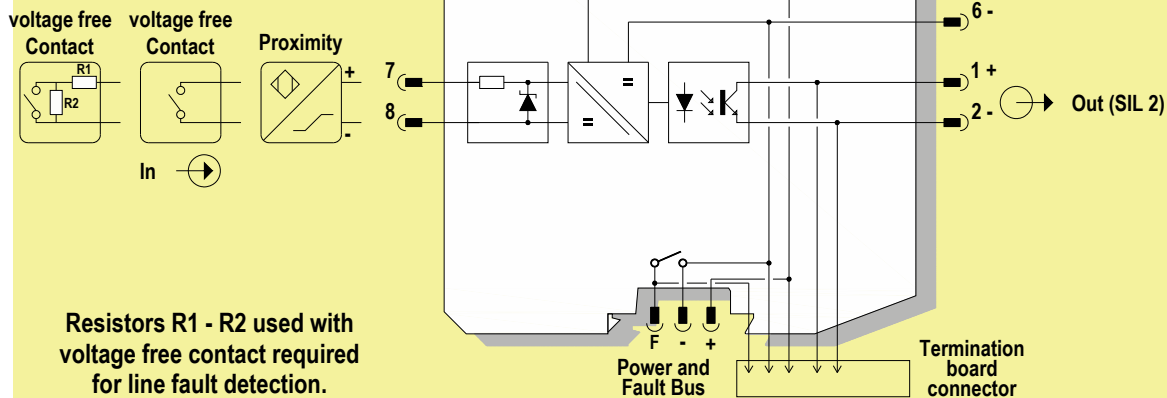
- |          |                       |
|----------|-----------------------|
| <b>1</b> | + Output Ch 1         |
| <b>2</b> | - Output Ch 1         |
| <b>3</b> | + Output Ch 2         |
| <b>4</b> | - Output Ch 2         |
| <b>5</b> | + Power Supply 24 Vdc |
| <b>6</b> | - Power Supply 24 Vdc |

MODEL D6037D



Resistors R1 - R2 used with voltage free contact required for line fault detection.

MODEL D6037S



Resistors R1 - R2 used with voltage free contact required for line fault detection.

## Warning

D6037 series must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards. Failure to properly installation or use of the equipment may risk to damage the unit or severe personal injury. The unit cannot be repaired by the end user and must be returned to the manufacturer or his authorized representative. Any unauthorized modification must be avoided.

## Operation

D6037 module is a unit suitable for applications requiring SIL 2 level (according to IEC 61508) in safety related systems for high risk industries. The unit can be configured for switch or proximity detector (EN60947-5-6, NAMUR), NO or NC and for NO or NC optocoupled open collector transistor output. Each channel enables a load to be controlled by a switch, or a proximity detector. Fault detection circuit (DIP switch configurable) is available for both proximity sensor and switch equipped with end of line resistors. In case of fault, when enabled it de-energizes the corresponding output transistor and turns the fault LED on; when disabled the corresponding output transistor repeats the input line open or closed status as configured. In case of fault output, transistor driving can be programmed as normally close or normally open. Presence of supply power and status of output (energized or de-energized), as well as integrity or fault condition of sensor and connecting line are displayed by signaling LEDs (green for power, yellow for status and red for fault condition).

**Note:** use of voltage free electrical contacts with fault detection enabled (control equipment) requires, near the switch at the end of the line a  $R1=1\text{ k}\Omega$  typical ( $470\ \Omega$  to  $2\text{ k}\Omega$  range) resistor in series and a  $R2=10\text{ k}\Omega$  typical ( $5\text{ k}\Omega$  to  $15\text{ k}\Omega$  range) resistor in parallel to the contacts in order to allow the fault detection circuit to distinguish between a condition of contact close/open and a line open/short circuit fault.

## Installation

D6037 series are Switch/Proximity Detector Interface housed in a plastic enclosure suitable for installation on T35 DIN-Rail according to EN50022, with or without Power Bus or on customized Termination Board. D6037 unit can be mounted with any orientation over the entire ambient temperature range. Electrical connection of conductors up to  $2.5\text{ mm}^2$  are accommodated by polarized plug-in removable screw terminal blocks which can be plugged in/out into a powered unit without suffering or causing any damage. The wiring cables have to be proportionate in base to the current and the length of the cable. On the section "Function Diagram" and enclosure side a block diagram identifies all connections. Identify the number of channels of the specific card (e.g. D6037S is a single channel model and D6037D is a dual channel model), the function and location of each connection terminal using the wiring diagram on the corresponding section, as an example:  
Connect 24 Vdc power supply positive at terminal "5" and negative at terminal "6".  
For Model D6037S connect positive output of channel 1 at terminal "1" and negative output at "2".  
For Model D6037D in addition to channel 1 connections above, connect positive output of channel 2 at terminal "3" and negative output at "4".  
For Model D6037S, in case of Proximity or Voltage free Contact, connect the wires at terminal "7" for positive and "8" for negative.  
For Model D6037D in addition to channel 1 connections above, connect terminal "9" for positive and "10" for negative on channel 2.

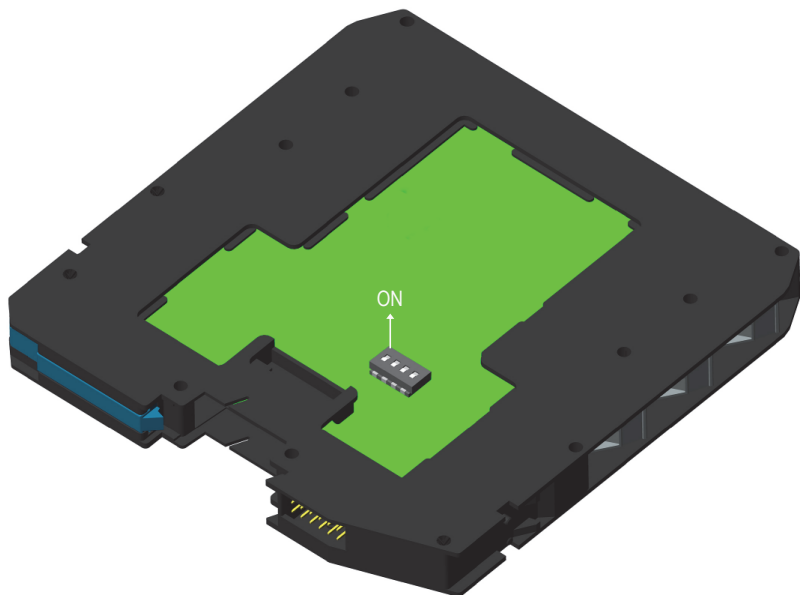
Connect SPST output transistors checking the load rating to be within the maximum rating (100 mA at 35 Vdc ( $\leq 1.5\text{ V}$  voltage drop)). Units must be protected against dirt, dust, extreme mechanical (e.g. vibration, impact and shock) and thermal stress, and casual contacts. If enclosure needs to be cleaned use only a cloth lightly moistened by a mixture of detergent in water. Any penetration of cleaning liquid must be avoided to prevent damage to the unit. Any unauthorized card modification must be avoided. According to EN61010, D6037 series must be connected to SELV or SELV-E supplies.

## Start-up

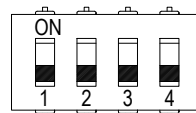
Before powering the unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Turn on power, the "power on" green led must be lit, status and fault led on each channel must be in accordance with condition of the corresponding input line. If possible close and open input lines one at time checking the corresponding status and fault leds condition as well as output to be correct.

**D6037D**

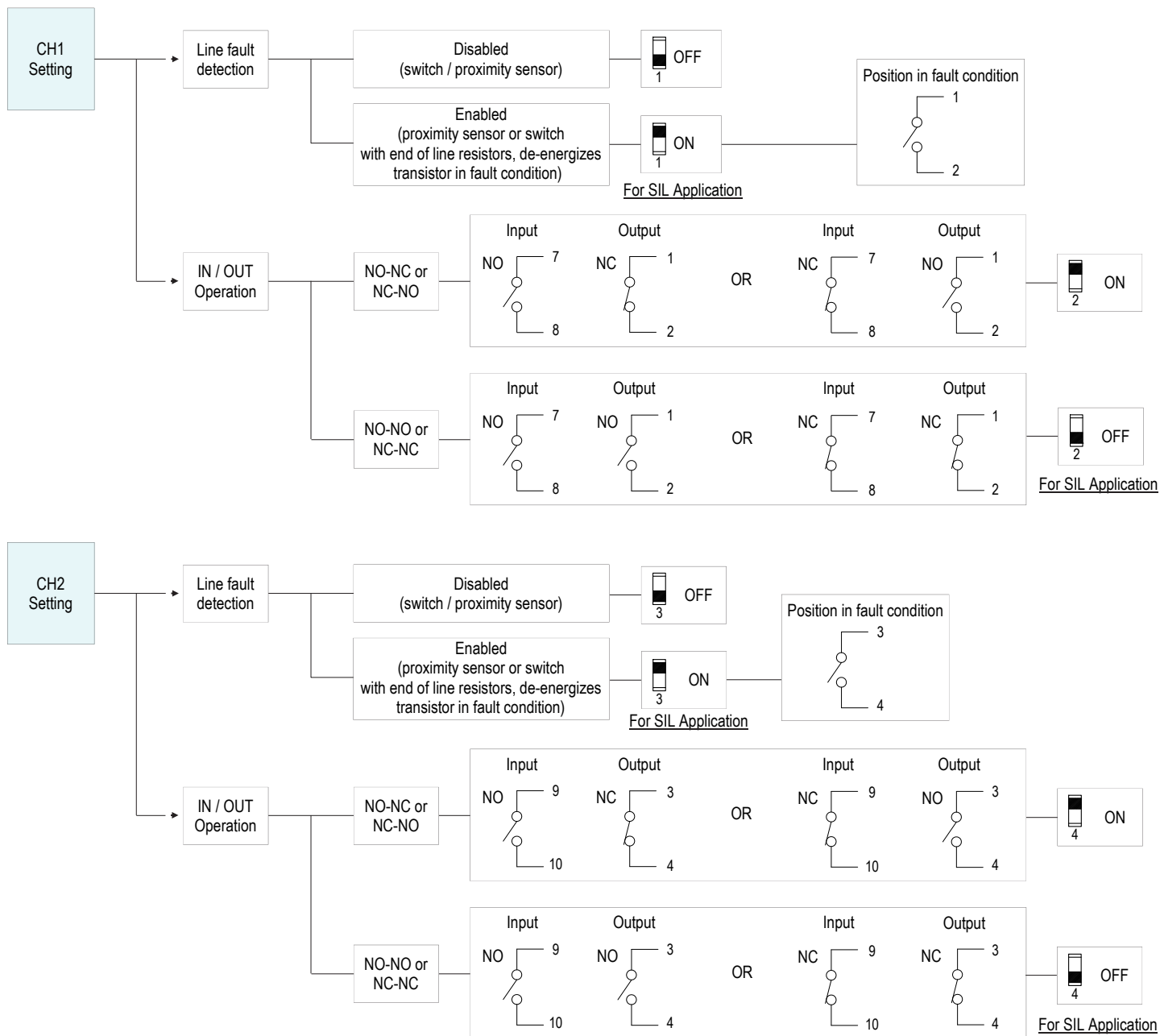
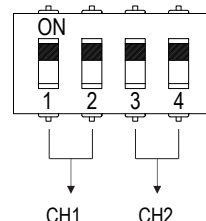
A configuration DIP switch is located on component side of pcb. This switch allows the configuration of input/output relationship, fault detection functions and operating mode.



Dip switch factory settings. All Switches are OFF



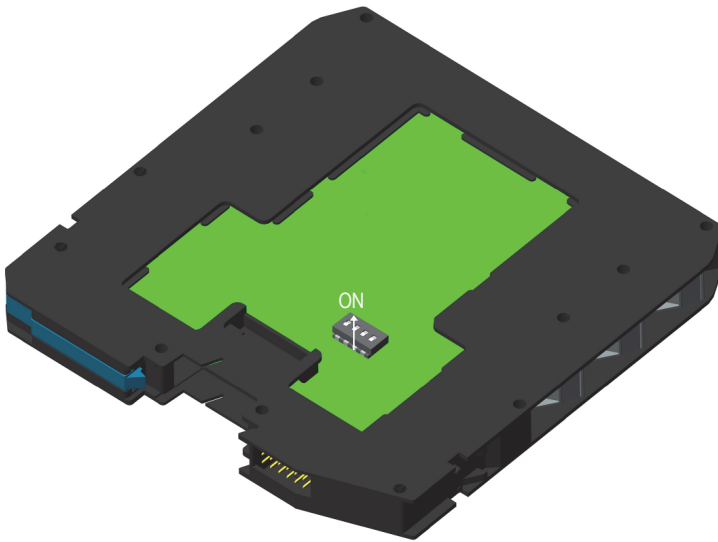
Dip switch configuration



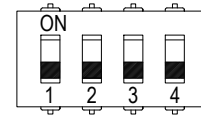
## Configuration

### D6037S

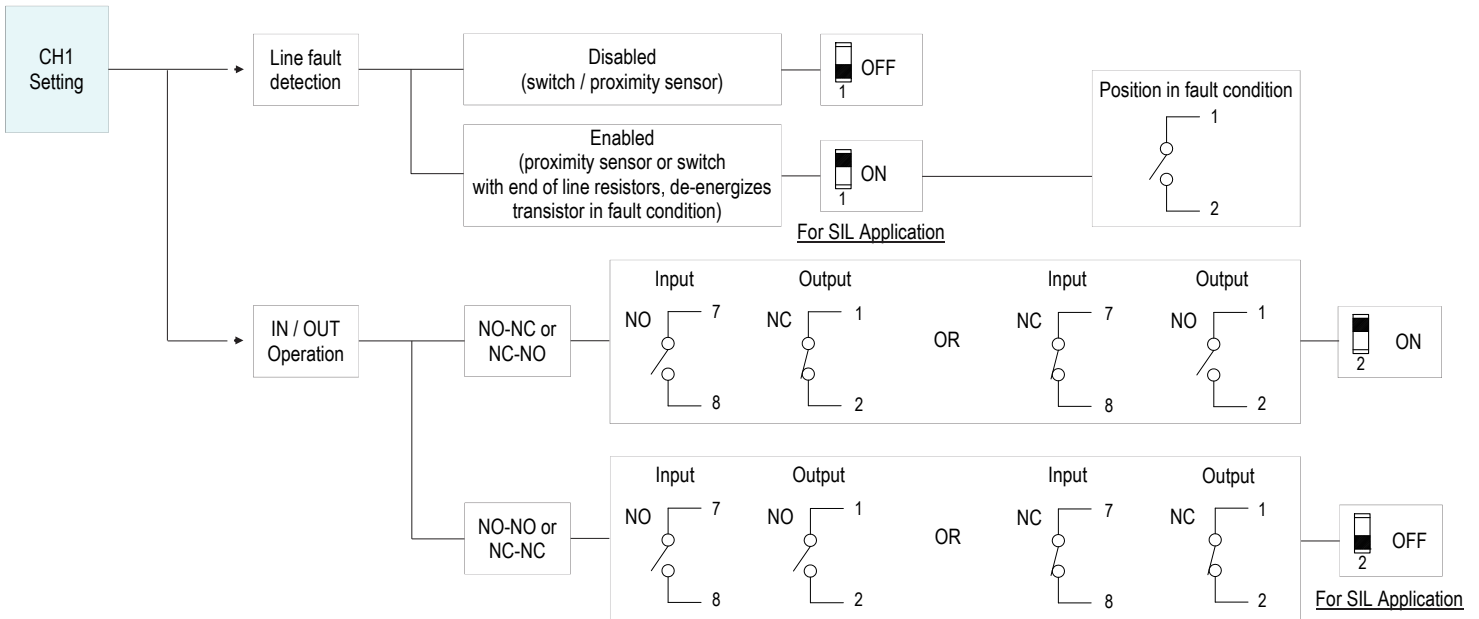
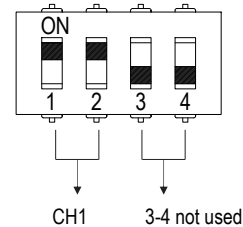
A configuration DIP switch is located on component side of pcb. This switch allows the configuration of input/output relationship, fault detection functions and operating mode.



Dip switch factory settings. All Switches are OFF



Dip switch configuration



## Configuration

### DIP Switch factory settings (valid for D6037S and D6037D)

SW1	SW2	SW3	SW4
OFF	OFF	OFF	OFF

Note: SW3 and SW4 used only in D6037D.

### D6037D Configuration Summary Table

Channel	1	2
Line fault detection	SW1	SW3
Disabled (switch/proximity sensor)	OFF	OFF
Enabled, <u>for SIL application</u> (proximity sensor or switch with end of line resistors, detects field open circuit and short circuit, de-energizes transistor in fault condition)	ON	ON

Channel	1	2
IN/OUT Operation	SW2	SW4
NO-NC or NC-NO	ON	ON
NO-NO or NC-NC ( <u>for SIL application</u> )	OFF	OFF

### D6037S Configuration Summary Table

Line fault detection	SW1
Disabled (switch/proximity sensor)	OFF
Enabled, <u>for SIL application</u> (proximity sensor or switch with end of line resistors, detects field open circuit and short circuit, de-energizes transistor in fault condition)	ON

IN/OUT Operation	SW2
NO-NC or NC-NO	ON
NO-NO or NC-NC ( <u>for SIL application</u> )	OFF

Note: SW3 and SW4 not used.