INSTRUCTION MANUAL

SIL3 Line-Fault Transp. Switch/Prox. Repeater, DIN-Rail and Termination Board Models D6038S*, D6038D*, D6038X*

technology for safety

Characteristics

General Description:

The Switch/Proximity Detector Repeater D6038 is a module suitable for applications requiring SIL 3 level in safety related systems for high risk industries. The unit can be configured for switches or proximity detectors (EN60947-5-6, NAMUR) and repeats the input state to the output. The output port can assume two different impedance values (RL or RH) or it can open completely. The module output repeats the input state according to the following correspondence: low input state -> RL, high input state -> RH. Alternatively, the output can be configured to invert the input state. In both cases, the output opens if any fault (open or short circuit) occurs at the corresponding input.

Functional Safety Management Certification:

G.M. International is certified by TUV 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.
Current consumption: 30 mA (D6038D), 25 mA (D6038X), 15 mA (D6038S), @ 24 Vdc, typical.
Power dissipation: 1.0 W (D6038D), 1.0 W (D6038X), 0.4 W (D6038S), @ 24 Vdc, 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:

Input switching current levels: ON ≥ 2.1 mA, OFF ≤ 1.2 mA.
Open fault: current ≤ 0.05 mA.
Short fault: resistance ≤ 100 Ω.
No fault: current ≥ 0.35 mA and resistance ≥ 360 Ω.
Input equivalent source: 8 V 1 kΩ typical (8 V no load, 8 mA short).

Output:

Voltage free SPST solid-state relays, with series (RL) and parallel (RH-RL) resistances, ±5% tolerance.
Fault impedance: > 1 MΩ.
Max voltage: 30 Vdc.
Max current: 15 mA.
Response time: 500 µs.
Frequency response: 1 kHz maximum.

Compatibility:

CE mark compliant, conforms to Directives: 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:

TUV Certificate No. TUV IT 25 SIL 0634 SIL 3 conforms to IEC61508:2010 Ed. 2.
SIL 3 Functional Safety TÜV Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.

Mounting:

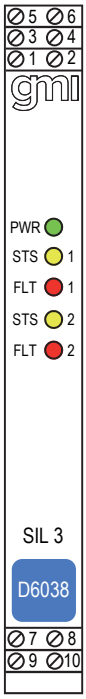
EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Board.
Weight: about 135 g (D6038D and D6038X), 120 g (D6038S).
Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm² (13 AWG).
Protection class: IP 20.
Dimensions: Width 12.5 mm, Depth 123 mm, Height 120 mm.

Ordering Information

Model:	D6038		
1 channel		S	
2 channels		D	
duplicator		X	
RL = 2.2kΩ, RH = 14.3kΩ			A
RL = 476Ω, RH = 1.38kΩ			B
RL = 5kΩ, RH = 15kΩ			C
RL = 0Ω, RH = 33.2kΩ			D

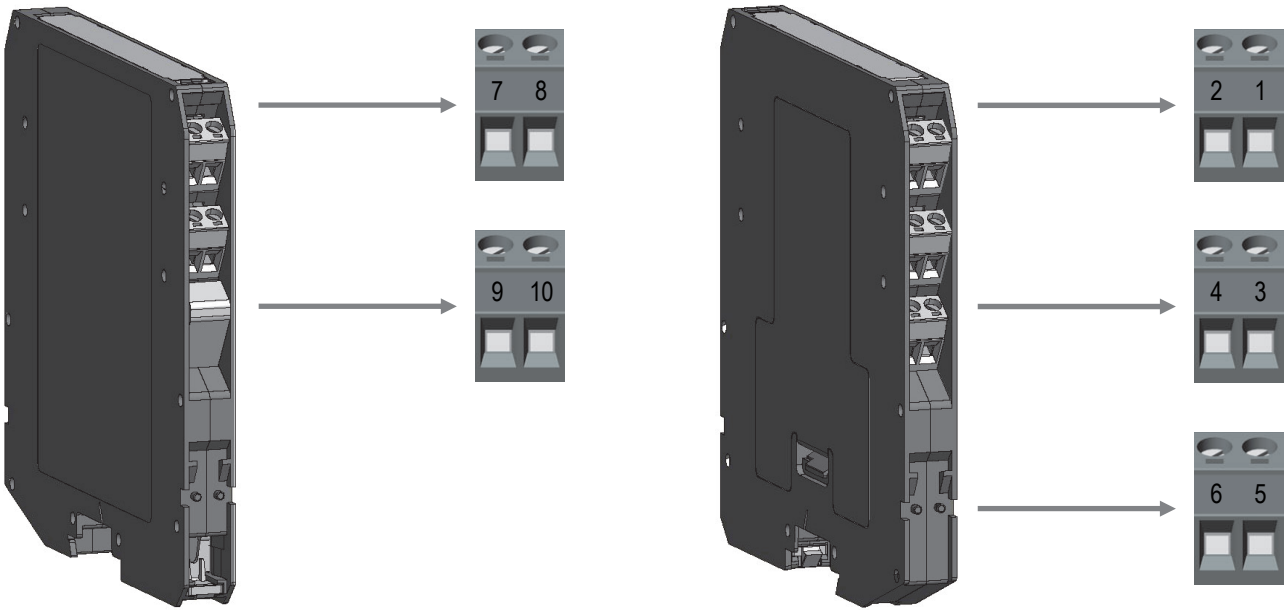
Power Bus and DIN-Rail accessories:
Bus connector JDFT049 Bus mounting kit OPT5096

Front Panel and Features



- SIL 3 (low demand mode of operation) according to IEC 61508:2010 Ed.2 with Tproof = 2 / 5 yrs (≤ 10 / >10 % of total SIF).
- SC 3: Systematic Capability SIL 3
- Field open and short circuit detection
- Field fault universal mirroring to PLC DI
- Line monitoring transparency
- In-field programmability by DIP Switch
- Three port isolation, Input/Output/Supply
- High Density, two channels per unit

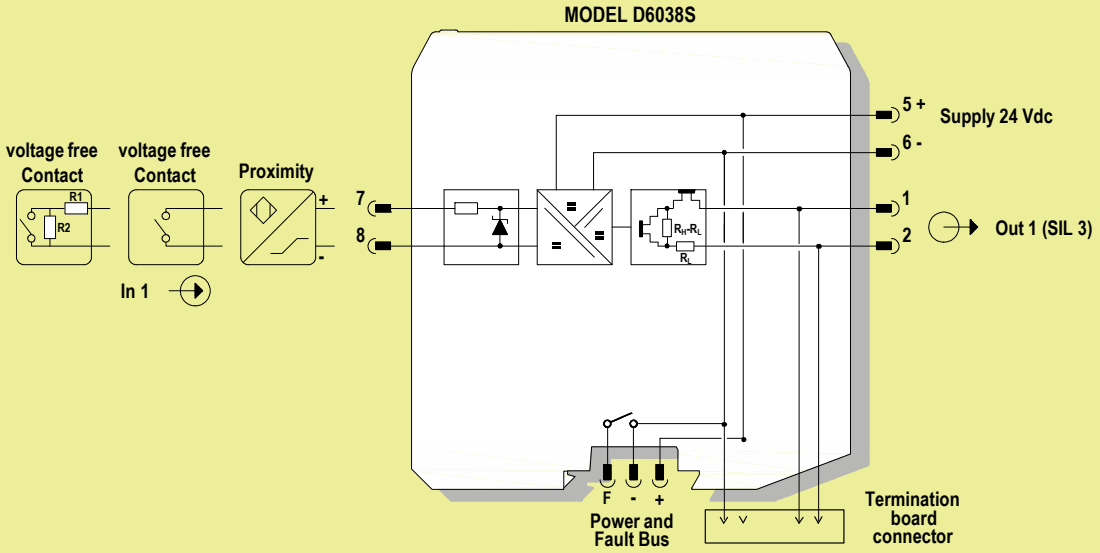
Terminal block connections

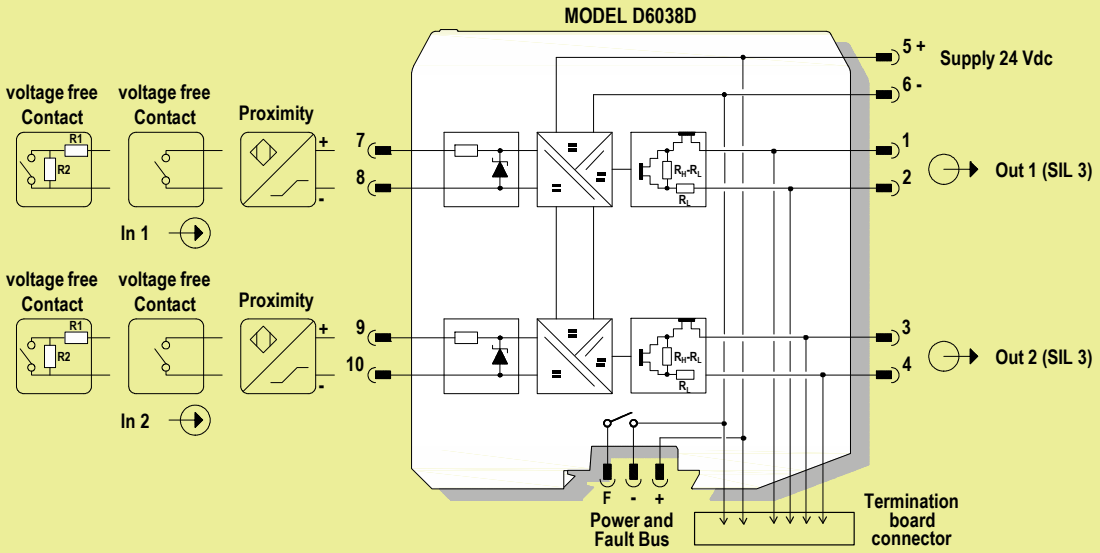


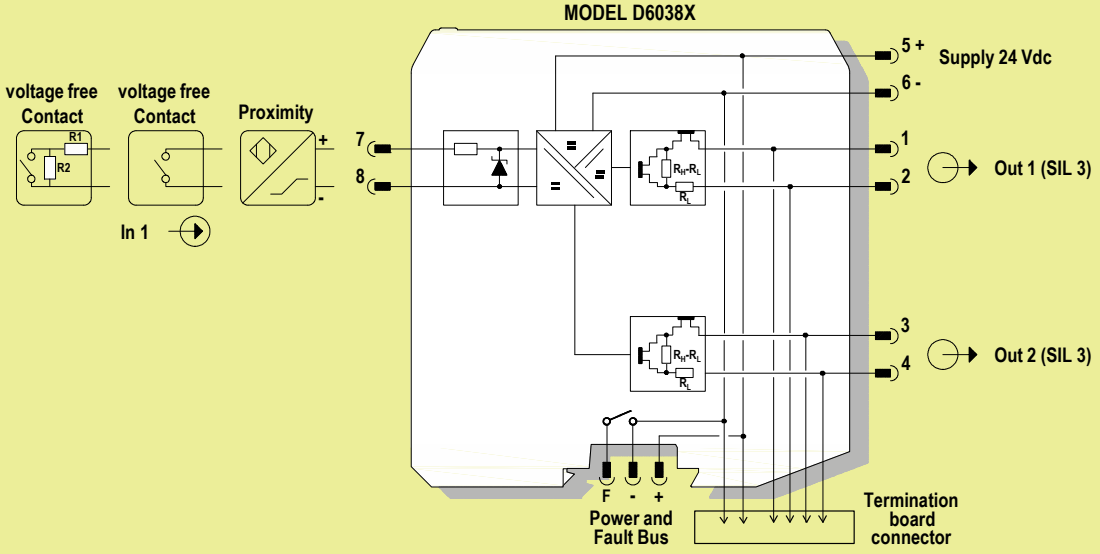
7	+ Input Ch 1 for proximity or voltage free contact
8	- Input Ch 1 for proximity or voltage free contact
9	+ Input Ch 2 for proximity or voltage free contact
10	- Input Ch 2 for proximity or voltage free contact
11	-
12	-

1	Output Ch 1
2	Output Ch 1
3	Output Ch 2
4	Output Ch 2
5	+ Power Supply 24 Vdc
6	- Power Supply 24 Vdc

Function Diagram







Warning

D6038 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

D6038 series can accept on input connections switches or proximity detectors (EN60947-5-6, NAMUR). The output port can assume two different impedance values (RL or RH) or it can open completely. The module output repeats the input state according to the following correspondence: low input state -> RL, high input state -> RH. Alternatively, the output can be configured to invert the input state. In both cases, the output opens and the fault LED turns on if any fault (open or short circuit) occurs at the corresponding input.
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 kΩ typical (470 Ω to 2 kΩ range) resistor in series and a R2=10 kΩ typical (5 kΩ to 15 kΩ 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

D6038 series is switch/proximity repeater housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Board. D6038 series can be mounted with any orientation over the entire ambient temperature range.
Electrical connections 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. Connect only one individual conductor per each clamping point, use conductors up to 2.5 mm² (13 AWG) and a torque value of 0.5-0.6 Nm. Use only cables that are suitable for a temperature of at least 85°C.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.
The enclosure provides, according to EN60529, an IP20 minimum degree of protection (or similar to NEMA Standard 250 type 1). The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1. The end user is responsible to ensure that the operating temperature of the module is not exceeded in the end use application.
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 modification must be avoided.
D6038 series must be connected to SELV or PELV supplies.
All circuits connected to D6038 series must comply with the overvoltage category II (or better) according to EN/IEC60664-1.

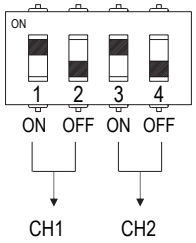
Start-up

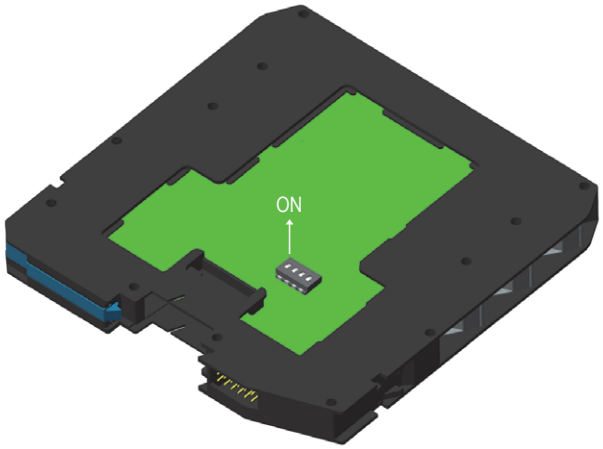
Before powering the unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Turn on power, the “power on” green led must be lit, status 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.

Configuration

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. Configuration of channel 2 is relevant only for D6038D*.

Dip switch factory settings.
Switches 1 and 3 are ON, switches 2 and 4 are OFF





Line fault detection

CH1 ON 1, CH2 ON 3	Enabled (proximity sensor or switch with end of line resistors, output opens in fault condition)	→ For SIL application
CH1 OFF 1, CH2 OFF 3	Disabled (switch / proximity sensor)	

IN / OUT operation

CH1 OFF 2, CH2 OFF 4	Direct function: closed (Input) → RL (Output); or open (Input) → RH (Output)	→ For SIL application
CH1 ON 2, CH2 ON 4	Reverse function: open (Input) → RL (Output); or closed (Input) → RH (Output)	→ For SIL application