



# INSTRUCTION MANUAL

SIL 3 Relay Output Module  
DIN-Rail Models D1092S-069, D1092D-069

## SIL Applications

For Safety Related System and SIL2, SIL3 Applications according IEC61508 & IEC61511 Standards refer to "Functional Safety Manual" document number ISM0071

## Characteristics

**General Description:** The single and dual channel DIN Rail Relay Output, D1092S-069 and D1092D-069 are relay modules suitable for the switching of safety related circuits, up to SIL 3 level according to IEC61508, for high risk industries. Isolation is provided between input and output contacts, and between the two channels of D1092D-069.

**Function:** 1 or 2 totally independent and isolated relays for safety related circuits.

**D1092S-069:** SIL 3 Safety Function for NE relay (de-energized in safe state) is available at Terminal Blocks 1-2; in this case, the safety function is met when the relay is de-energized (open contact). SIL 3 Safety Function for NE relay (de-energized in safe state) is available at Terminal Blocks 3-4; in this case, the safety function is met when the relay is de-energized (closed contact).

**D1092D-069:**

SIL 3 Safety Function NE relay (de-energized in safe state) is available at Terminal Blocks 1-2 and Terminal Blocks 5-6; in this case, the safety function is met when the relays are de-energized (open contacts). SIL 3 Safety Function for NE relay (de-energized in safe state) is available at Terminal Blocks 3-4 and Terminal Blocks 7-8; in this case the safety function is met when the relays are de-energized (closed contacts).

**Signalling LEDs:** Relay status (yellow).

**EMC:** Fully compliant with CE marking applicable requirements.

## Technical Data

**Input:** 24 Vdc nom (20.4 to 27.6 Vdc) reverse polarity protected, ripple within voltage limits  $\leq 5$  Vpp.

**Current consumption @ 24 V:** 50 mA for each channel with relay energized, typical (100 mA for 2 channels D1092D-069 when used as duplicator 1 input / 2 outputs).

**Power dissipation:** 1.2 W for each channel with 24 V input voltage and relay energized, typical (2.4 W for 2 channels D1092D-069 when used as duplicator).

**Max. power consumption:** at 27.6 V input voltage and relay energized, 1.5 W for each channel (3.0 W for 2 channels D1092D-069 when used as duplicator).

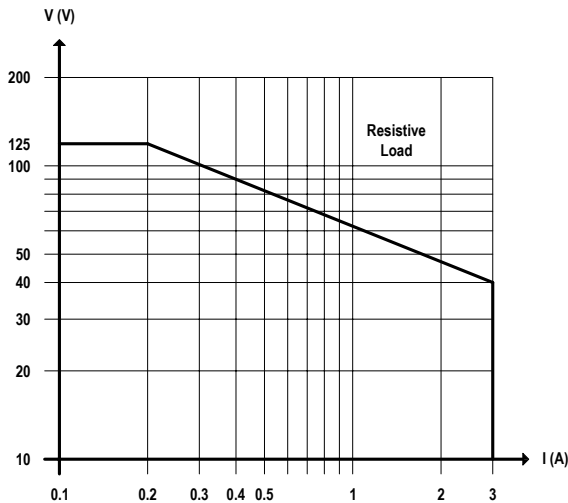
**Isolation (Test Voltage):** Input/Output 2.5 KV; Input/Input 500 V; Output/Output 2.5 KV; Output A/Output B 1.5 KV.

**Output:** voltage free SPST NO + SPST NC relay contact.

**Contact material:** Ag Alloy (Cd free).

**Contact rating:** 3 A 250 Vac 750 VA, 3 A 125 Vdc 120 W (resistive load).

**DC Load breaking capacity:**



**Mechanical / Electrical life:**  $50 * 10^6 / 1 * 10^5$  operation, typical.

**Operate / Release time:** 5 / 3 ms typical.

**Bounce time NO / NC contact:** 3 ms.

**Frequency response:** 10 Hz maximum.

**Compatibility:**



CE mark compliant, conforms to 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.

**Environmental conditions: Operating:** temperature limits  $-20$  to  $+60$  °C, relative humidity max 90 % non condensing, up to 35 °C.

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

**Safety Description:**



II 3G Ex nAC IIC T4 non-incendive electrical apparatus.  $-20$  °C  $\leq$  Ta  $\leq$  60 °C.

**Approvals:** IMQ 09 ATEX 013 X conforms to EN60079-0, EN60079-15,

FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3611, 3810 and C22.2 No.142, C22.2 No.213, E60079-0, E60079-15.

TUV Certificate No. C-IS-183645-01, SIL 3 according to IEC 61508. Please refer to Functional Safety Manual for SIL applications.

**Proof Test Interval:** 10 years for SIL3 application (10 % of SIF) or 20 years for SIL3 application (20 % of SIF).

**Mounting:** T35 DIN Rail according to EN50022.

**Weight:** about 160 g D1092D-069, 125 g D1092S-069.

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

**Location:** Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4, Class I, Division 2, Groups A, B, C, D Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA T4 installation.

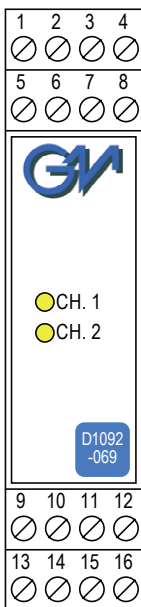
**Protection class:** IP 20.

**Dimensions:** Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

## Ordering information

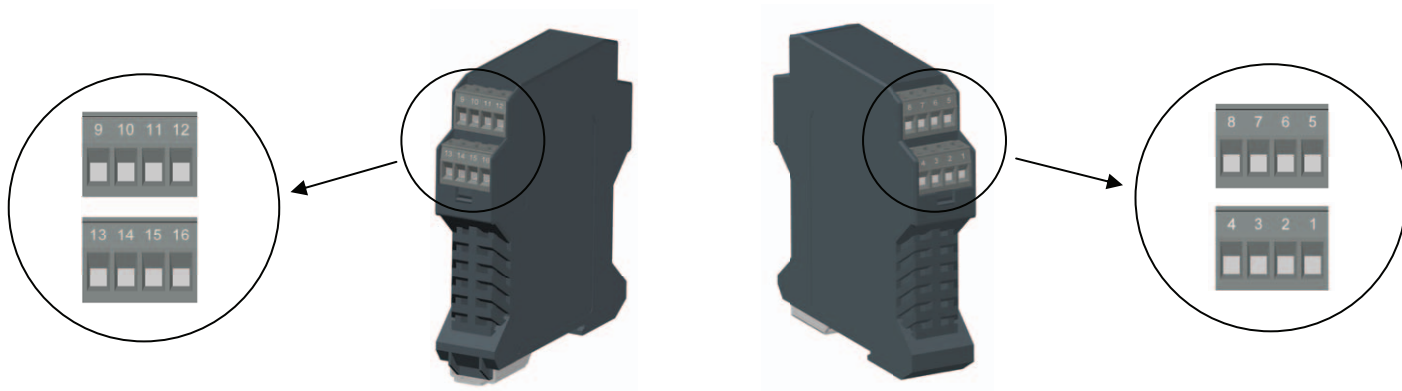
Model:	D1092	
1 channel		S-069
2 channels		D-069

## Front Panel and Features



- SIL 3 according to IEC 61508 for Tproof = 10 / 20 years (10 / 20 % of total SIF) for NE Relay (1 SPST NO or NC contact).
- PFDavg (1 year) 7.01 E-06, SFF 99.13 %.
- Installation in Zone 2, Division 2.
- 2 fully independent channels.
- 1 SPST NO contact and 1 SPST NC contact for each channel.
- Input/Output isolation.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- ATEX, FM & FM-C Certifications.
- TUV Certification for SIL.
- High Reliability, SMD components.
- High Density, two channels per unit.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.

## Terminal block connections



### SAFE AREA

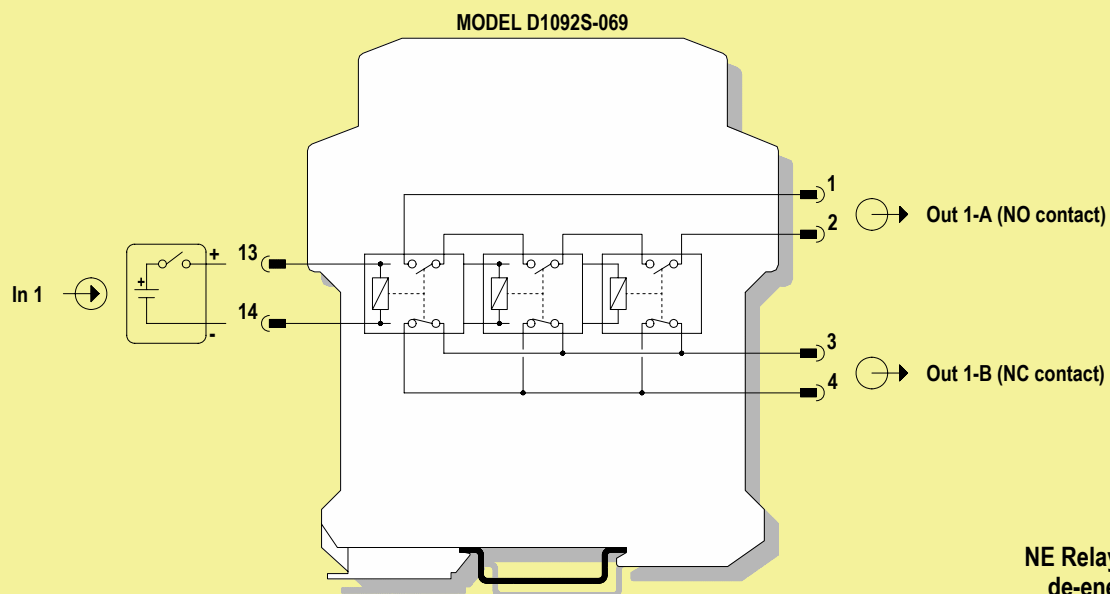
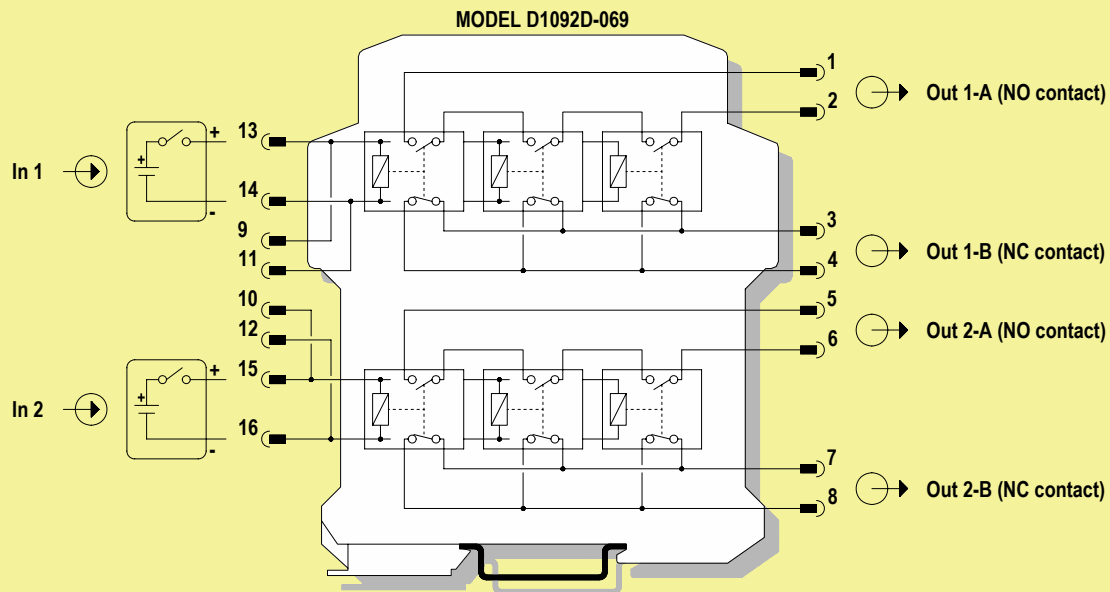
<b>9</b>	+ Input Ch 1 connected to terminal 13
<b>10</b>	+ Input Ch 2 connected to terminal 15
<b>11</b>	- Input Ch 1 connected to terminal 14
<b>12</b>	- Input Ch 2 connected to terminal 16
<b>13</b>	+ Input Ch 1
<b>14</b>	- Input Ch 1
<b>15</b>	+ Input Ch 2
<b>16</b>	- Input Ch 2

### SAFE AREA

<b>1</b>	Output Ch 1-A (NO contact)
<b>2</b>	Output Ch 1-A (NO contact)
<b>3</b>	Output Ch 1-B (NC contact)
<b>4</b>	Output Ch 1-B (NC contact)
<b>5</b>	Output Ch 2-A (NO contact)
<b>6</b>	Output Ch 2-A (NO contact)
<b>7</b>	Output Ch 2-B (NC contact)
<b>8</b>	Output Ch 2-B (NC contact)

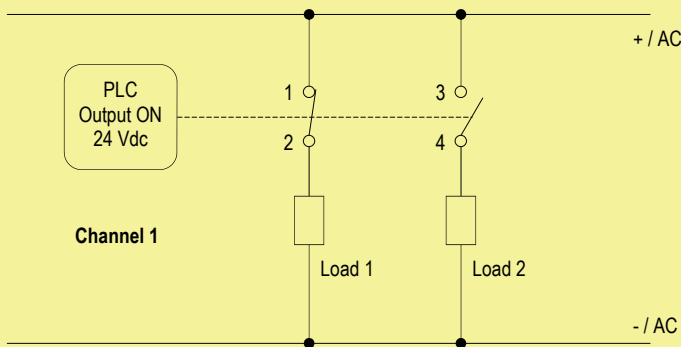
## Function Diagram

SAFE AREA, ZONE 2 GROUP IIC T4,  
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2, GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



NE Relay module shown in  
de-energized (safe) state

Application for D1092S-069 - Normally Energized Condition (NE)

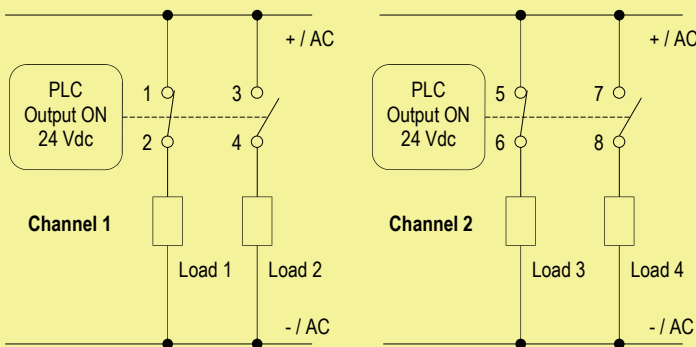


**Channel 1**

**Contacts 1-2:** SIL 3 Function is met when contacts are in open state.

**Contacts 3-4:** SIL 3 Function is met when contacts are in closed state.

Application for D1092D-069 - Normally Energized Condition (NE) and two independent driving signals from PLC



**Channel 1**

**Contacts 1-2:** SIL 3 Function is met when contacts are in open state.

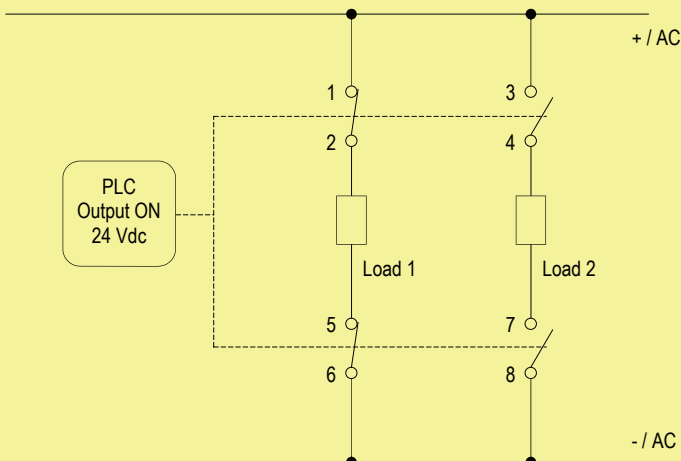
**Contacts 3-4:** SIL 3 Function is met when contacts are in closed state.

**Channel 2**

**Contacts 5-6:** SIL 3 Function is met when contacts are in open state.

**Contacts 7-8:** SIL 3 Function is met when contacts are in closed state.

Application for D1092D-069 - Normally Energized Condition (NE) and one common driving signal from PLC for the two relays



**Contacts 1-2:** SIL 3 Function is met when contacts are in open state.

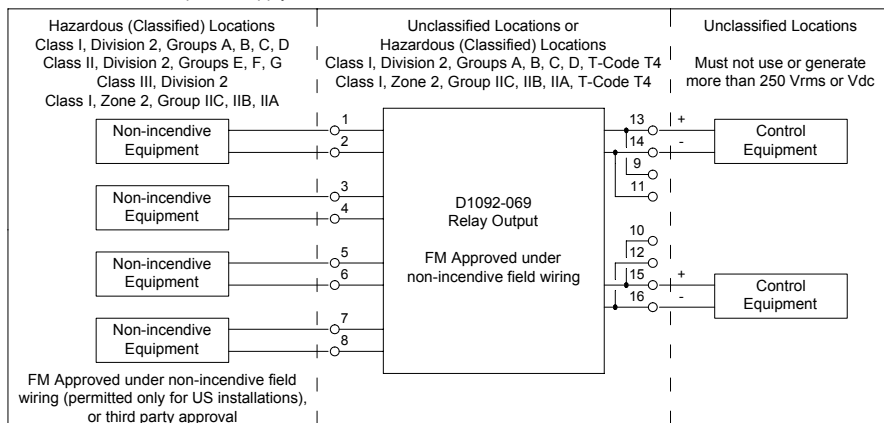
**Contacts 3-4:** SIL 3 Function is met when contacts are in closed state.

**Contacts 5-6:** SIL 3 Function is met when contacts are in open state.

**Contacts 7-8:** SIL 3 Function is met when contacts are in closed state.

## Warning

D1092-069 series are isolated electrical apparatus installed into standard EN50022 T35 DIN Rail located in Safe Area/Non Hazardous Locations or Zone 2, Group IIC, Temperature Classification T4, Class I, Division 2, Groups A, B, C, D, Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA Temperature Code T4 Hazardous Area/Hazardous Locations (according to EN/IEC60079-15, FM Class No. 3611, CSA-C22.2 No. 213-M1987, CSA-E60079-15) within the specified operating temperature limits Tamb -20 to +60 °C, and connected to equipment with a maximum limit for AC power supply of 250 Vrms.



Non-incandescent field wiring is not recognized by the Canadian Electrical Code, installation is permitted in the US only.

For installation of the unit in a Class I, Division 2 or Class I, Zone 2 location, the wiring between the control equipment and the D1092-069 electrical apparatus shall be accomplished via conduit connections or another acceptable Division 2, Zone 2 wiring method according to the NEC and the CEC.

Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground.

D1092-069 series must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC) following the established installation rules.

De-energize power source (turn off power supply voltage) before plug or unplug the terminal blocks when installed in Hazardous Area/Hazardous Locations or unless area is known to be nonhazardous.

**Warning: substitution of components may impair Intrinsic Safety and suitability for Division 2, Zone 2.**

**Warning: de-energize main power source (turn off power supply voltage) and disconnect plug-in terminal blocks before opening the enclosure to avoid electrical shock when connected to live hazardous potential.**

**Explosion Hazard: to prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or unless area is known to be nonhazardous.**

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

D1092-069 relay modules are suitable for the switching of safety related circuits, providing isolation between the input and output contacts. D1092S-069, when the relay is de-energized, provides 1 SPST NO (Normally Open) contact and 1 SPST NC (Normally Closed) contact. D1092D-069, when the relays are de-energized, provides 2 independent circuits, each with 1 SPST NO (Normally Open) contact and 1 SPST NC (Normally Closed) contact. The channels and the relay contacts are completely isolated. For each channel, a "RELAY STATUS" yellow led lights when input is powered, showing that relay is energized and relay output contacts are closed (for SPST NO contact) or open (for SPST NC contact).

## Installation

D1092-069 series are relay output modules housed in a plastic enclosure suitable for installation on T35 DIN Rail according to EN50022.

D1092-069 unit can be mounted with any orientation over the entire ambient temperature range, see "Installation of Electronic Equipments in the Cabinet" guide ISM0075 for detailed instructions.

Electrical connection of conductors up to 2.5 mm<sup>2</sup> 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 (for Zone 2 or Division 2 installations check the area to be nonhazardous before servicing).

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. D1092S-069 is a single channel model and D1092D-069 is a dual channel model), the function and location of each connection terminal using the wiring diagram on the corresponding section, as an example:

For Model D1092S-069 connect positive input of channel 1 at terminal "13" and negative input at "14".

For Model D1092D-069 in addition to channel 1 connections above, connect positive input of channel 2 at terminal "15" and negative input at "16".

For Model D1092D-069 is also possible to control both channels with the same input (of channel 1 or 2), connecting a wired jumper between terminals "9" and "10" (for positive input duplication) and a wired jumper between terminals "11" and "12" (for negative input duplication).

For Model D1092S-069, the terminals "1" and "2" are the two poles of SPST NO contact used to enable or disable the load circuit. Generally, the relay contact is used to break positive or negative supply line of load circuit. Then, connect wire of supply line at terminal "1" and link another wire at terminal "2" to continue the supply line of load circuit.

For Model D1092D-069 in addition to channel 1 connections above, use terminals "5" and "6" of channel 2 as two poles of SPST NO contact used to enable or disable the second load circuit.

For Model D1092S-069, the terminals "3" and "4" are the two poles of SPST NC contact used to enable or disable the load circuit. Generally, the relay contact is used to break positive or negative supply line of load circuit. Then, connect wire of supply line at terminal "3" and link another wire at terminal "4" to continue the supply line of load circuit.

For Model D1092D-069 in addition to channel 1 connections above, use terminals "7" and "8" of channel 2 as two poles of SPST NC contact used to enable or disable the second load circuit.

Installation and wiring must be in accordance to the relevant national or international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC), make sure that conductors are well isolated from each other and do not produce any unintentional connection.

Connect SPST relay contacts checking the load rating to be within the contact maximum rating (3 A, 250 Vac or 125 Vdc, 750 VA 120 W resistive load).

**If necessary, to prevent relay contacts from damaging, an external protection (fuse or similar) should be connected.**

**A suitable protection must be chosen according to the relay breaking capacity diagram on data sheet.**

The enclosure provides, according to EN60529, an IP20 minimum degree of mechanical protection (or similar to NEMA Standard 250 type 1) for indoor installation, outdoor installation requires an additional enclosure with higher degree of protection (i.e. IP54 to IP65 or NEMA type 12-13) consistent with the effective operating environment of the specific installation. 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.

**Electrostatic Hazard: to avoid electrostatic hazard, the enclosure of D1092-069 must be cleaned only with a damp or antistatic cloth.**

Any penetration of cleaning liquid must be avoided to prevent damage to the unit. Any unauthorized card modification must be avoided.

Relay output contact must be connected to loads non exceeding category I, pollution degree I overvoltage limits.

**Warning: de-energize main power source (turn off power supply voltage) and disconnect plug-in terminal blocks before opening the enclosure to avoid electrical shock when connected to live hazardous potential.**

## Start-up

Before powering the inputs of unit check that all wires are properly connected, also verifying their polarity. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Enabling each input, the corresponding "RELAY STATUS" yellow led must be lit and relay must be energized, so that SPST NO contact is closed and SPST NC contact is open. Indeed, disabling each input, the corresponding "RELAY STATUS" yellow led must be turned off and relay must be de-energized, so that SPST NO contact is open and SPST NC contact is closed.

## Installation in Cabinet

### Power Dissipation of D1092-069 Isolators

Section "Technical Data" of D1092-069 isolator specifies the current consumption (maximum current from the nominal power supply, typical 24 Vdc, in normal operation); this data serves to dimension the current rating of the power supply unit. Section "Technical Data" indicates also the maximum power consumption (maximum power required from the power supply in the worst (abnormal) operating conditions like for example supply voltage at 30 Vdc, short circuit on the outputs and on the inputs terminals.


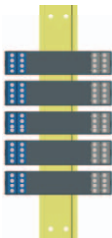

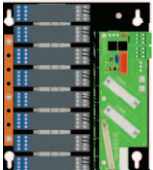
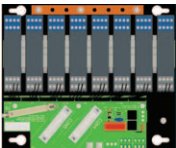
The power dissipated  $P_d$  inside the enclosure for analog signal isolators is:  $P_d = \text{Current Consumption (A)} * \text{Supply Voltage (V)} - \text{Power Dissipated into the input/output loads}$

Analog signal isolators have higher dissipation than digital signal isolators, in addition 2 channels barriers (D1092D-069) have higher dissipation than single channel units (D1092S-069).

In analog signal isolators each transmitter requires and dissipates  $15\text{ V} * 0.02\text{ A} = 0.3\text{ W}$ . Usually the loads outside the isolator dissipate 1/3 of the total power used. Isolators are not running at the maximum current all at the same time, the average power consumption of a multitude of isolators can be considered to be only 70 % of the value obtained from the section "Technical Data". Considering the 1/3 load power and the 70 % above discussed, the power effectively dissipated internally by the isolators can therefore become 1/2 of the actual power delivered by the power supply. Digital barriers dissipate all the supply power inside the enclosure consequently the total power dissipation into a cabinet, with mixed analog and digital barriers, is determined by the number of channels more than by the number of isolator enclosures. The following tables give advises for the DIN rail orientation (vertical or horizontal) of the barriers mounting, D1092D-069 (double channel) and D1092S-069 (single channel) isolators, installed on DIN rail, bus or custom board assembly.

### A) Cabinet with Natural Ventilation


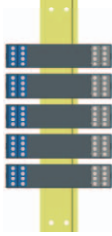
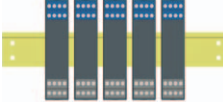
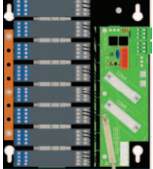
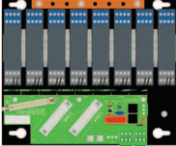
Maximum recommended ambient temperature in °C depending on barrier type and installation method:

Type of Isolator	Single unit Installation	Installation of Multiple units with DIN-rail Bus		Installation on Custom Boards	
	Any orientation	Vertical	Horizontal	Vertical	Horizontal
					
D1092S-069	60°C	30°C	35°C	35°C	40°C
D1092D-069	60°C	Not recommended <sup>(1)</sup>	30°C	30°C	35°C

<sup>(1)</sup> Installation is not recommended since it would significantly shorten the units life and increase the probability of failures.

### B) Cabinet with Forced Ventilation

Maximum recommended ambient temperature in °C depending on barrier type and installation method:

Type of Isolator	Single unit Installation	Installation of Multiple units with DIN-rail Bus		Installation on Custom Boards	
	Any orientation	Vertical	Horizontal	Vertical	Horizontal
					
D1092S-069	60°C	40°C	45°C	45°C	50°C
D1092D-069	60°C	40°C	45°C	45°C	50°C