

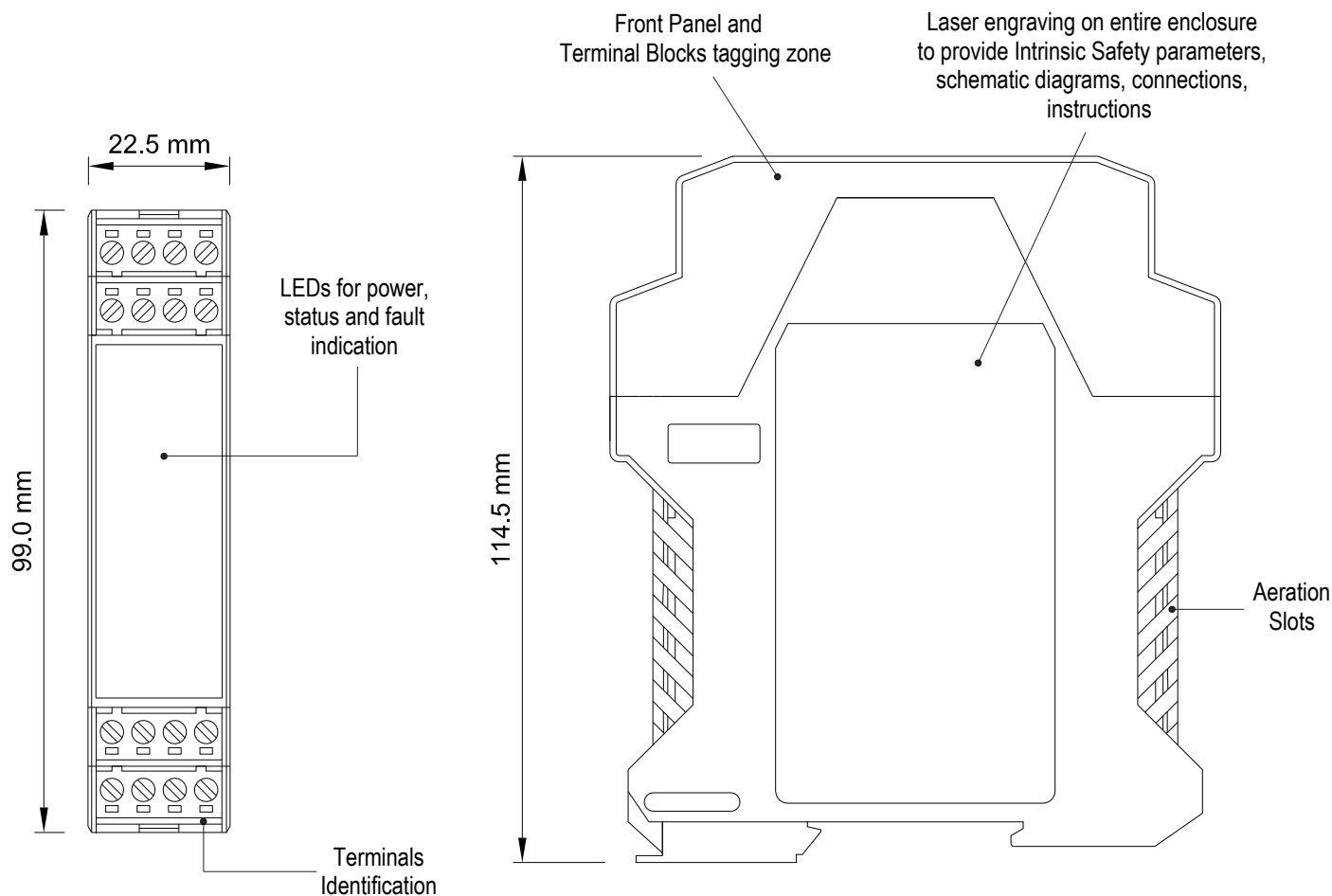
# INSTRUCTION MANUAL

## D1000 SERIES DIN-RAIL MOUNTING INTRINSICALLY SAFE ISOLATORS

**D1000 Intrinsically Safe Isolators**

Mechanical features.....	3
D1000 Power Bus Enclosure.....	4
Front Panel and PCB Removal.....	6
Terminal Blocks Connection Data .....	7
Mounting and Removing units from DIN-Rail .....	8
D1000 Series Configuration.....	10
Installation of electronic equipments in cabinet .....	12
Placement of Isolators in cabinet.....	13
Heat dissipation in cabinets.....	14
Calculation of radiant surfaces in closed cabinets.....	15
Approvals and Certifications.....	16
Storage .....	16
Disposal.....	16
Maintenance and Repair.....	16

Mounting	Dimensions	
T35 DIN Rail according to EN50022	Width	22.5 mm
	Depth	99.0 mm
	Height	114.5 mm
Case material	Blister packing size	
PA66 - Polyamide (Nylon) 66	Width	30.0 mm
	Depth	120.0 mm
	Height	120.0 mm

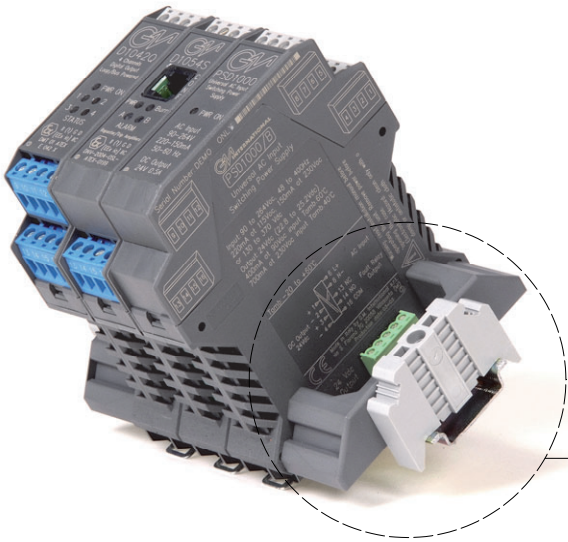


**Enclosure Characteristics**

- High channel density result from innovative circuit design using advanced surface mount components.
- Single, dual or quad channel models.
- Plug-in screw terminal blocks to secure termination up to 2.5 mm<sup>2</sup>.
- Plug-in PCB can be removed for service or maintenance operations (see section “Front Panel and PCB Removing”).

**High packing density**

- 35 mm (Top Hat) DIN-Rail.
- Ultra slim 4 channels 22.5 mm wide DIN-rail mounting modules.
- 6 mm per channel.
- Up to 176 I/O channels per meter of DIN-rail.
- Power Bus enclosure allows a significant reduction in cables, costs and space.



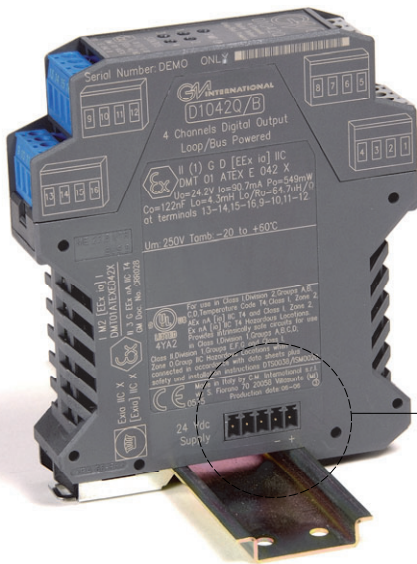
Power Supply Voltage 12-24 Vdc can be applied to the module, by connecting directly the voltage to the plug-in Terminal Block of each module, or via the Power Bus System. The system consists of a standard DIN-Rail and modules with Bus Connectors (female on one side and male on the other). The maximum allowed powering capacity is 8 Amp. It is always possible to remove modules, without disconnecting the bus connection. When the Power Bus is used, Supply Contacts on Terminal Blocks are omitted to avoid accidental short circuits on the Power Bus. Cumulative Fault Alarm indication is provided on the Bus connection. This signal is in common with the supply and drives a remote indication, typically through a D1091S module.



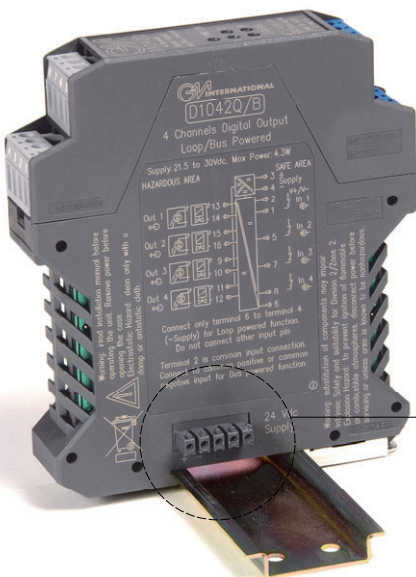
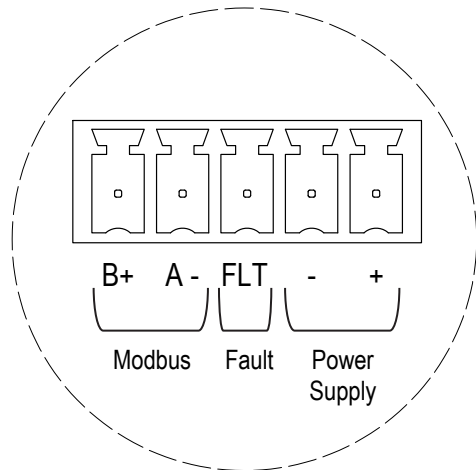
DIN-Rail Anchor for terminal block  
Side of the Power Bus



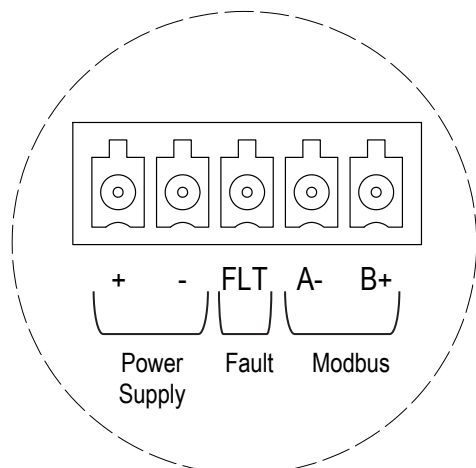
DIN-Rail Stopper



Module Enclosure with  
Power Bus Connector female Side

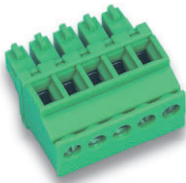
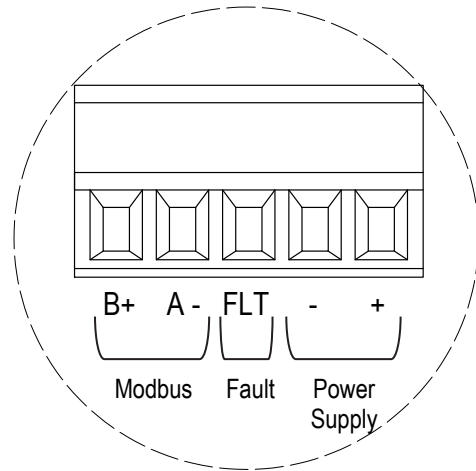


Module Enclosure with  
Power Bus Connector male Side





Module Enclosure with Power Bus Male Termination Block



Plug - in terminal block male, vertical out, for Power Bus



Plug - in terminal block male, horizontal out, for Power Bus

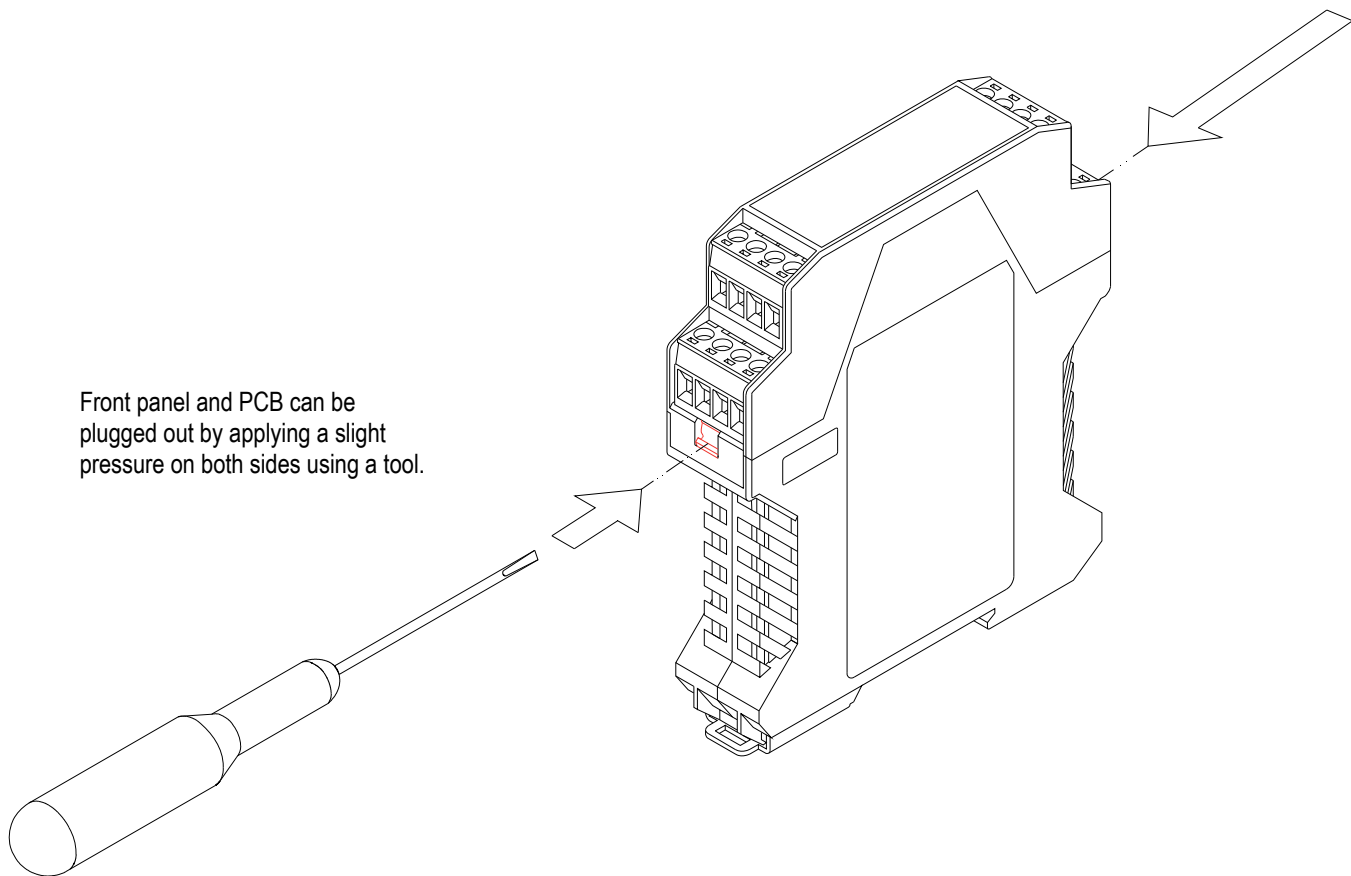


Plug - in terminal block female, horizontal out, for Power Bus

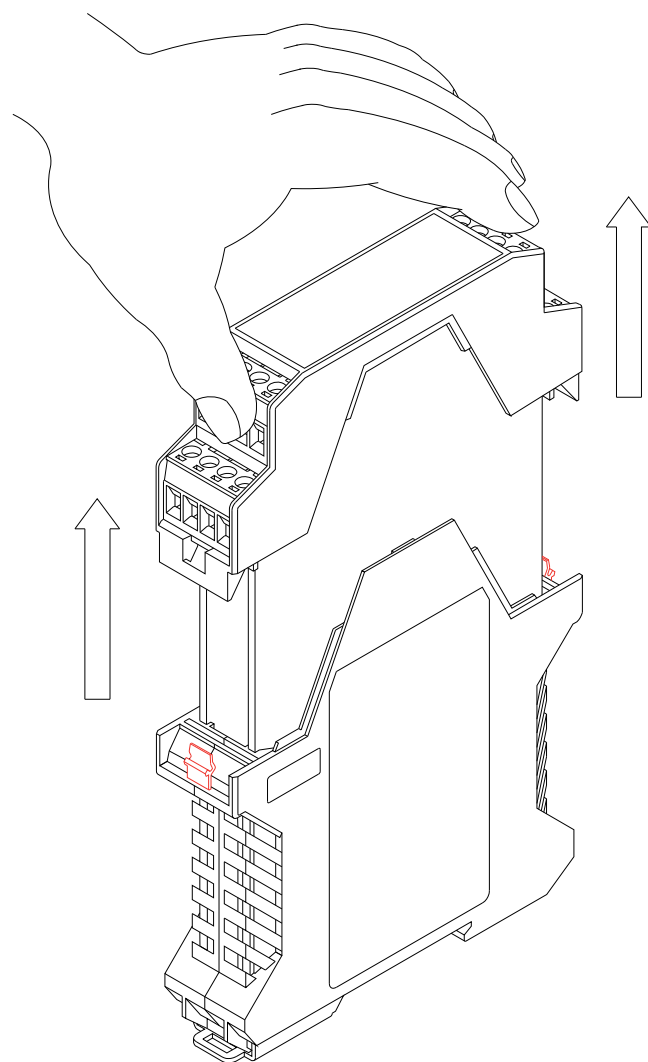
Ordering Information:

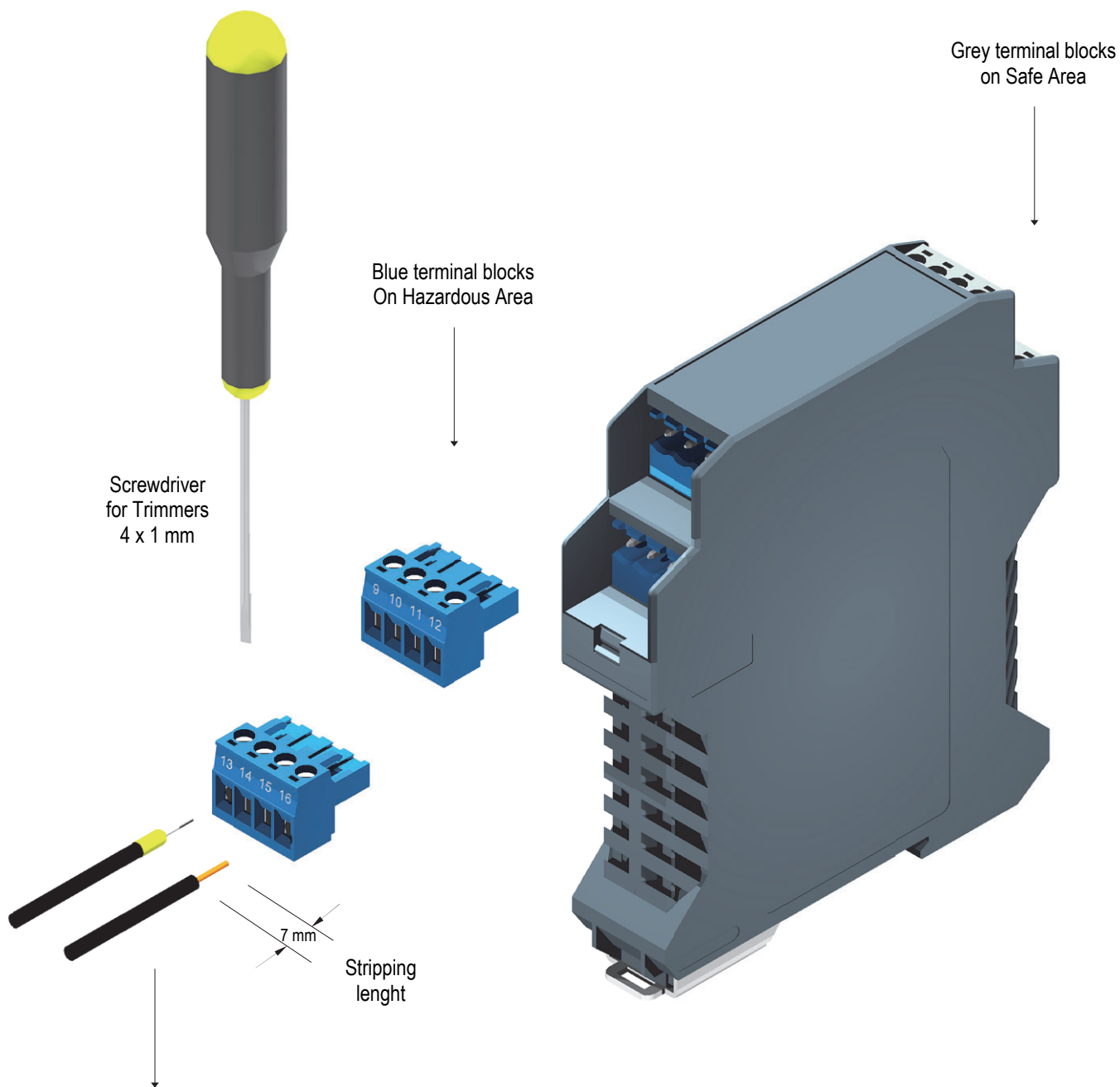
Image	Code	Description
	MCHP065	DIN-Rail Anchor for terminal block side of the Power Bus
	MCHP139	5 mm spacer for modules on DIN-Rail
	MOR016	DIN-Rail Stopper
	MOR015	Plug-in terminal block male, vertical out, for Power Bus
	MOR017	Plug-in terminal block male, horizontal out, for Power Bus
	MOR022	Plug-in terminal block female, horizontal out, for Power Bus
	OPT1096	Kit for Bus Mounting: 2 x MOR016, 1 x MOR017, 1 x MOR022, 2 x MCHP065
	/ B	Power Bus Enclosure

Front panel and PCB can be plugged out by applying a slight pressure on both sides using a tool.



Slowly pull out Front Panel and PCB. The PCB will slide on the enclosure dedicated guides.





Connection data	
Conductor cross section solid	From 0.2 mm <sup>2</sup> to 2.5 mm <sup>2</sup>
Conductor cross section stranded	From 0.2 mm <sup>2</sup> to 2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve	From 0.25 mm <sup>2</sup> to 2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve	From 0.25 mm <sup>2</sup> to 2.5 mm <sup>2</sup>
Conductor cross section AWG	From 24 to 12 AWG

Mounting

Fig. 1

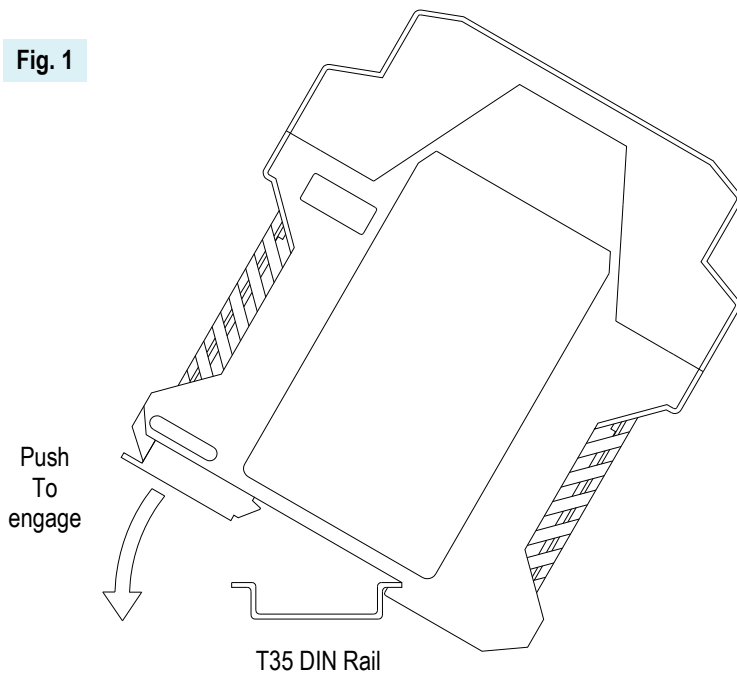
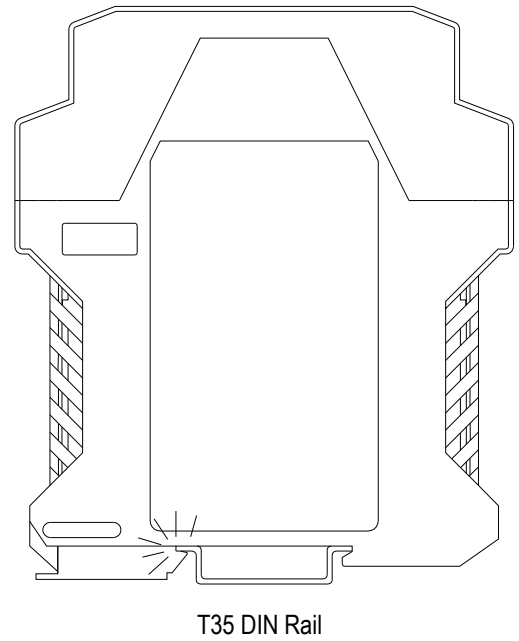


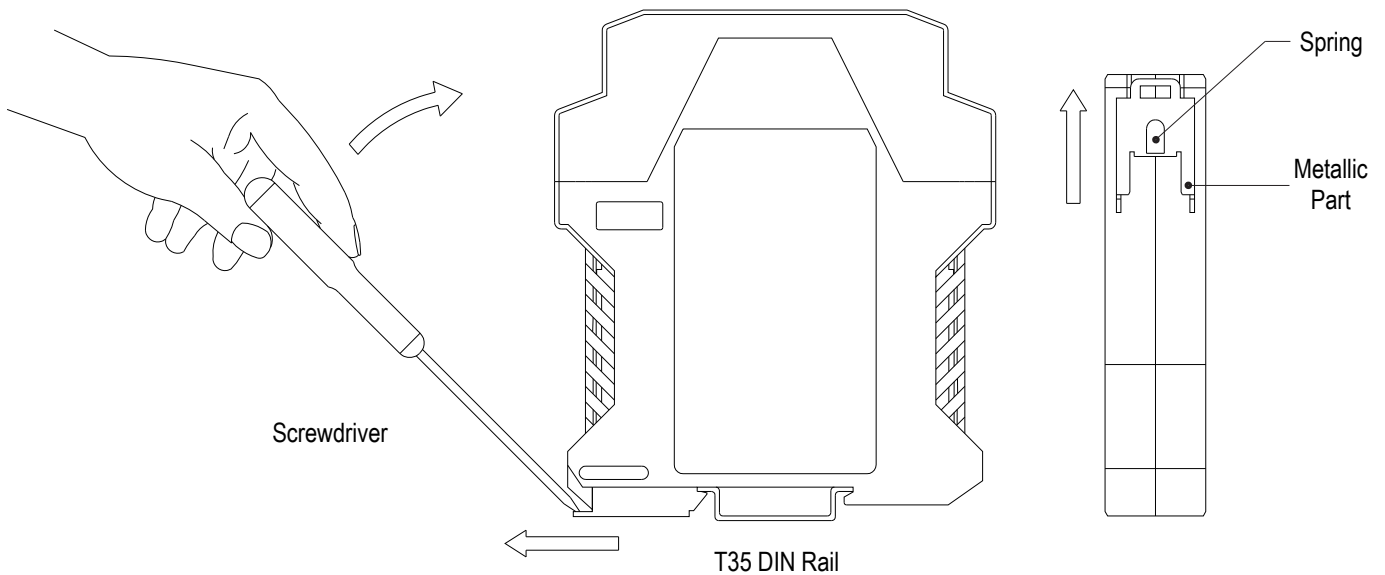
Fig. 2



To mount Series D1000 on 35 mm DIN Rail, hook one side of the mounting foot over the lip of the rail and press down firmly on the barrier (see Fig.1) to snap the other side of the mounting foot over the opposite rail lip (see Fig.2).

Removing

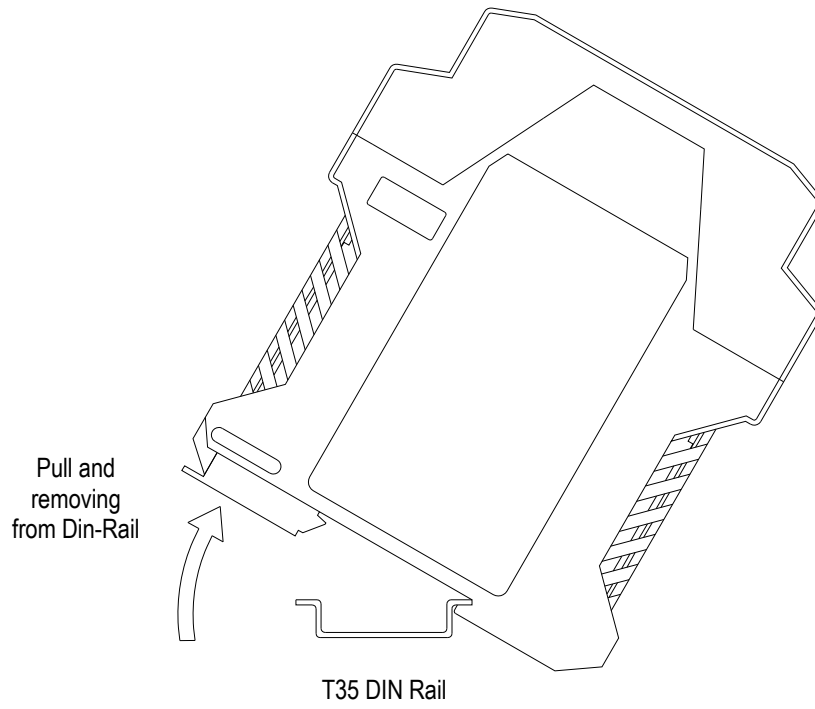
Fig. 3



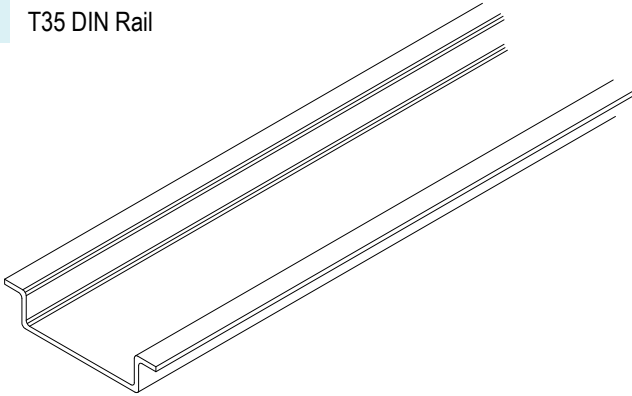
To remove a barrier from the mounting rail, insert the blade screwdriver in the metallic part of the mounting foot and lever the spring catch open against the side of the barrier casing (see Fig.3).



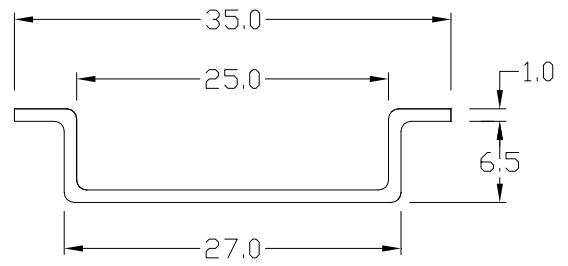
**Fig. 5**



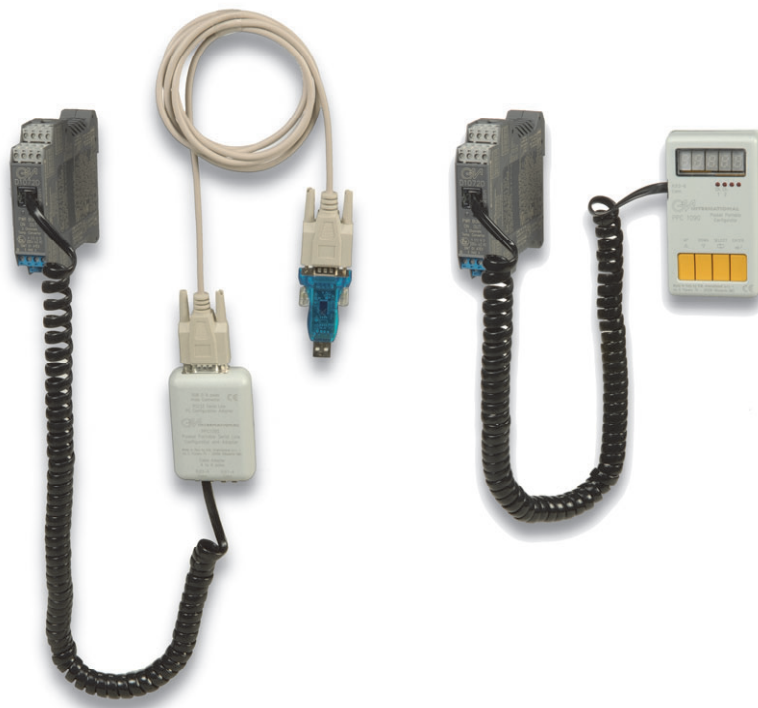
**Fig. 6** T35 DIN Rail



**Fig. 7** T35 DIN Rail Dimensions (millimeters)



The Pocket Portable Configurator type PPC1090 or PPC1092 is suitable to configure the “smart” barrier of D1000 series. The PPC1090/PPC1092 unit is not ATEX, UL or FM approved and is only to be used in Safe Area/Non Hazardous Locations and prior to installation of the isolator and prior to connection of any I.S. wiring. Do not use PPC1090/PPC1092 configurator in Hazardous Area/Hazardous Locations. The PPC1090 configurator is powered by the unit (no battery power) when the telephone jack is plugged into the barrier (RJ12 6 poles connector type with 1:1 connection). It has a 5 digit display, 4 leds and four push buttons with a menu driven configuration software and can be used in Safe Area/Non Hazardous Locations without any certification because it plugs into the non intrinsically safe portion of circuit. The PPC1092 adapter permits the configuration of the unit via a PC software program and acts as an interface for RS232 serial line and D1000 unit; it can be used in Safe Area/Non Hazardous Locations without any certification because it plugs into the non intrinsically safe portion of circuit. The main features of the converter can be easily configured, these are: type of input circuit, type of sensor, burnout operation, measuring range, type of output and range, refer to the next section of Instruction Manual for a detailed description of configuration and menu options.



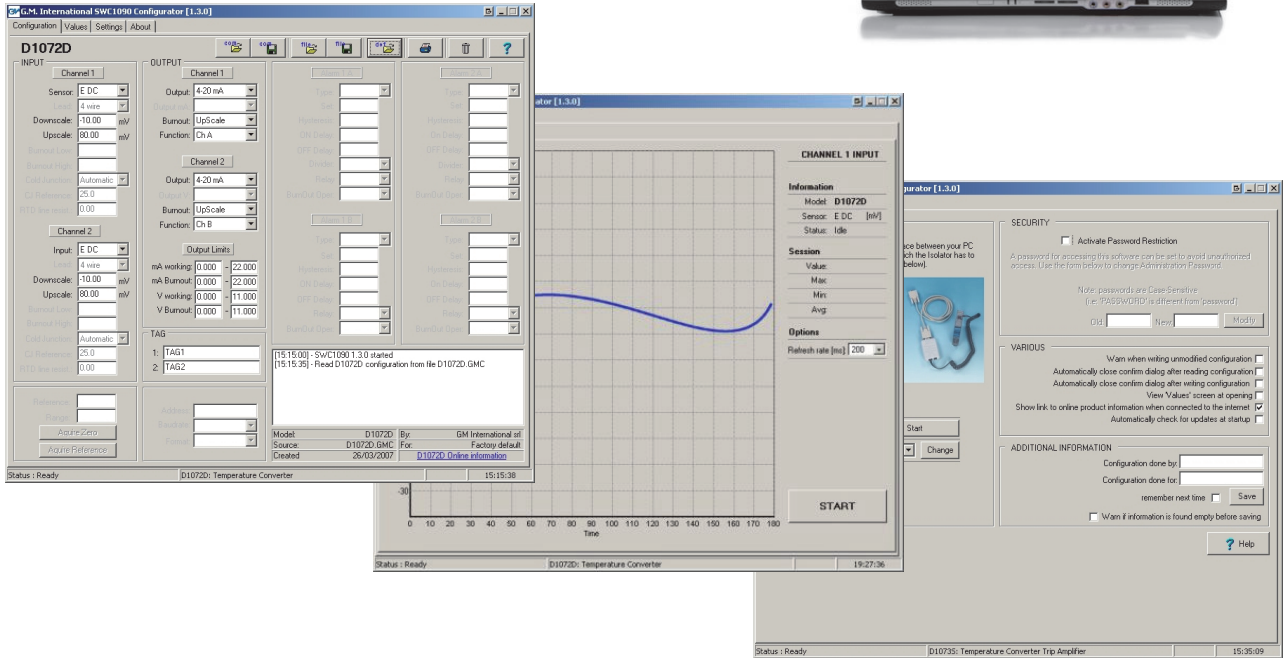
### PPC 1090 Pocket Portable Configurator

The PPC1090 is a small and handy Pocket Portable Configurator suitable to program configuration parameters of D1000 series modules like: type of input Sensors, input and output Ranges, Burnout conditions, High/Low Alarm mode, Relay NE/ND, Alarm Trip Point, Hysteresis value and ON/OFF Alarm delays. The Configurator is powered by the unit and can be plugged in without disconnecting the module.

Refer to specific module Instruction Manual for details on using the PPC1090

### PPC 1092 Serial Adapter

The PPC1092 adapter is needed to interface the PC with D1000 Series modules for a complete configuration of Input, Output and Alarm parameters. The package includes necessary cables and a USB to RS-232 Adapter; a CD-Rom with the SWC1090 Software is also provided. The SWC1090 can also be downloaded from our website.



**SWC1090 Software**

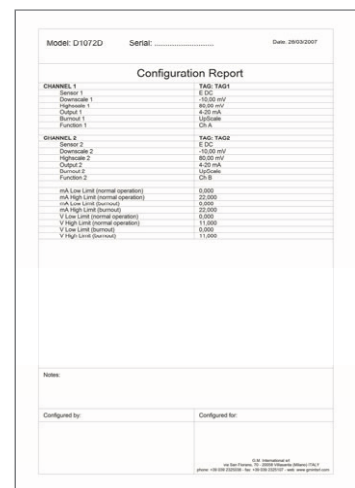
The SWC1090 software is designed to provide a PC user interface to configure programmable D1000 modules.

It easily allows the user to:

- Read and write configuration parameters to the units (via COM port);
- Store and restore data to and from local hard drive for backup or archive;
- Load factory default configurations;
- Monitor Input values via USB/COM port;
- Print a report sheet containing configuration parameters and additional information (see example on the right).

The SWC1090 is freely distributed at our website:

<http://www.gmintsl.com>



Example Configuration Report Sheet

All electronic equipment operate using electrical power and dissipate part of it into heat which is generally removed by the surrounding ambient air and determines an increase in the operating temperature. High operating temperatures reduce their life and increase the probability of failures according to the Arrhenius criteria, for example an operating temperature increase from 25 to 50 °C can cause a failure rate ten times higher. In a cabinet air circulates and removes heat by convection (natural convection cooling) or, more effectively, by forced ventilation (fans) or even more effectively by refrigerated forced ventilation (air conditioning). Installation of electronics in cabinets restricts free air movement and rises their internal temperature. These effects can be reduced in two concurring lines of action:

- by limiting the power dissipation and the heat produced inside the cabinet
- by encouraging air circulation (and exchange of heat) inside the cabinet

A simple way to improve air circulation is to provide space between the isolators, also installing isolators in horizontally oriented DIN rail rows with the enclosure main surfaces oriented vertically allows better air circulation inside the enclosure and significantly improves heat exchange.

What ultimately determines the operating temperature rise inside a cabinet is the total power dissipation and the provisions available for removing the heat with cool air (natural convection or forced cooling). The maximum power consumption of each type of isolator is specified in the corresponding data sheet so by summing the power of each unit in the cabinet the total power **Pmax** can be easily found. In normal operating conditions however the power dissipated by the installed equipments is not likely to be the maximum value specified for all of them and at the same time, the value of the effective power **Peff** can therefore be considered smaller (typical 70 %) than the value **Pmax**:

$$P_{eff} \leq \Sigma P_{max} * 70 \%$$

### 1) Closed Cabinets with Natural Convection

Closed cabinets are preferred in dusty or harsh environments where they offer a better equipment protection but their heat / power dissipation capability is modest. Heat is removed by air flowing internally and exchanged with the walls of the cabinet, the calculation of the maximum allowed power dissipation in this type of cabinet is:

$$P_{max} = \Delta t * S * K \quad \text{and} \quad \Delta t = \frac{P}{S * K}$$

where:

<b>Pmax [W]</b>	maximum allowed power dissipation
<b>Δt [°C]</b>	maximum allowed temperature rise
<b>S [m²]</b>	free heat emitting surface of the cabinet
<b>K [W/m² * °C]</b>	thermal conductivity coefficient (K=5.5 for painted steel sheets)

As an example a cabinet sized 600x600 mm and 2000 mm high has a temperature rise of 10 °C for an installed power of 250 W.

### 2) Open Cabinets with Natural Convection

Open cabinets must operate in clean environments, their heat / power dissipation capability is medium.

Heat is removed by air flowing through the equipment, circulating from bottom to top of cabinet (convection). Depending on the type of engineering (freedom of cool air to enter at the bottom of the cabinet, to circulate vertically around the equipment extracting heat and to exit at the top of the cabinet), the power dissipation improvement can be two times better than case 1.

The cabinet must be equipped with inlet and outlet louvers in the lower and upper ends of the cabinets, vertical air flow inside and outside the cabinet must be kept free from obstacles to enhance the "chimney effect" air circulation.

As an example a cabinet sized 600x600 mm and 2000 mm high has a temperature rise of 10 °C for an installed power of 350 W.

### 3) Open Cabinets with Forced Ventilation

Open cabinets must operate in clean environments, their heat / power dissipation capability is high with forced ventilation Air is forced into the louvers on the bottom of cabinet, flows through the equipments, and finally exits at the top of the cabinet, where generally is forced by one or more fans. The calculation of the required airflow is:

$$Q = 3.1 * P_{eff} / \Delta t$$

where:

<b>Q [m³/h]</b>	is the required air flow
<b>Peff [W]</b>	is the dissipated power (typical 70 % of the maximum power dissipation)
<b>Δt [°C]</b>	is the maximum allowed temperature rise in the cabinet

As an example a cabinet sized 600x600 mm and 2000 mm high has a temperature rise of 10 °C for an installed power of 500 W.

### 4) Closed Cabinets with Forced Ventilation and Heat Exchanger

Closed cabinets with forced ventilation are preferred in high dissipated power and harsh environment where natural convention cabinets cannot be used. Hot air is extracted from the cabinet by a fan, cooled by a heat exchanger (using a cooling fan with ambient air) and forced back into the cabinet; depending on the type of engineering the improvement can reach a 5 times higher power dissipation than in case 1.

As an example a cabinet sized 600x600 mm and 2000 mm high has a temperature rise of 10 °C for an installed power of 1000 W.

## 5) Air Conditioned Cabinets

Air conditioned cabinets are preferred in hot climates and / or harsh environments. Cabinet temperature can become equal or even lower than the ambient temperature. A specific refrigerating system or the existing air conditioning system can be used for cabinet conditioning. As an example a cabinet sized 600x600 mm and 2000 mm high has a temperature rise of 10 °C for an installed power of 1000 W.

### Placement of isolators in cabinet

The placement of the barriers in the cabinet has an important impact on the ambient temperature. The following points should be considered:

1. The sum of the individual dissipated power of the installed barriers plus other devices need to be below the calculated or given maximum dissipation power of the cabinet.
2. The D1000 series could be installed in horizontal or vertical mounting position. The installation in horizontal position offers an improved heat transport.
3. Place the units with higher dissipation power in the upper part of the cabinet.
4. If you apply ventilation please consider the following:
  - a) When applying temperature control you have to install the temperature sensor in the upper part of the cabinet.
  - b) It is more effective to install a fan into the roof of the cabinet rather than in the lower part of the cabinet.
5. Take care about reasonable distance between D1000 series and cable channels. We recommend a distance of 6 cm. (see figure 1 and 2). If the place in the cabinet does not allow to keep the distance we strongly recommend to place the DIN rail away from the back side of the cabinet by means of distance bolts.

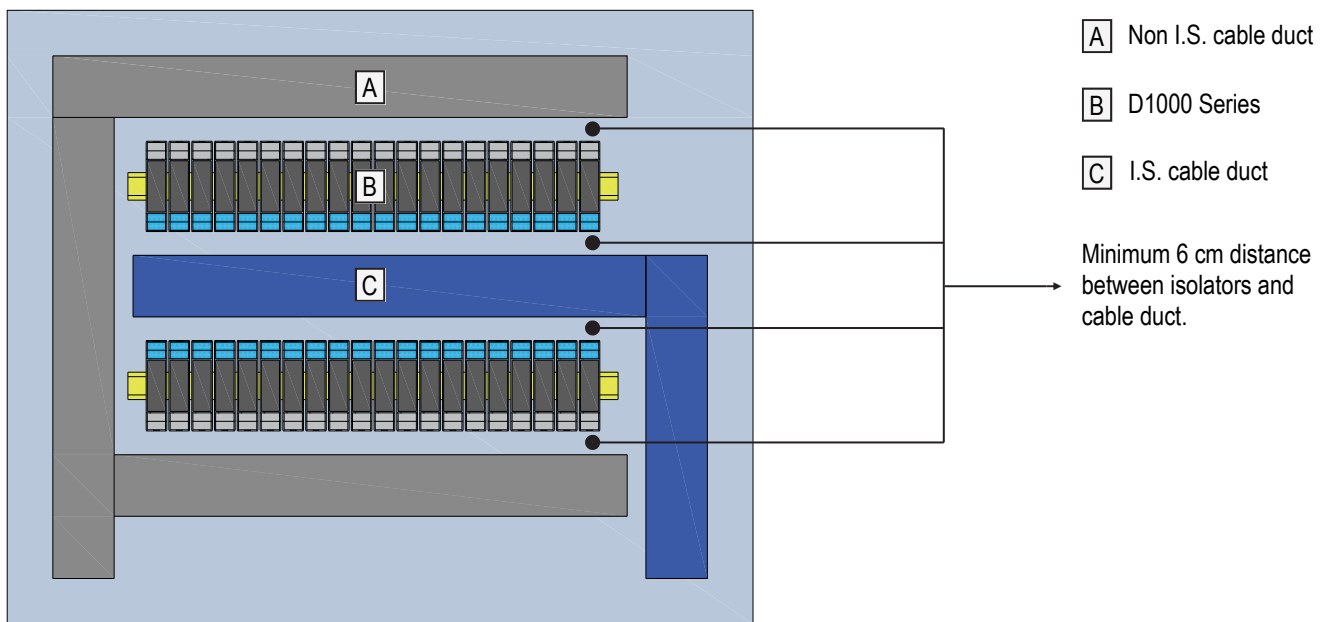


Fig. 1 Horizontal orientation in the cabinet

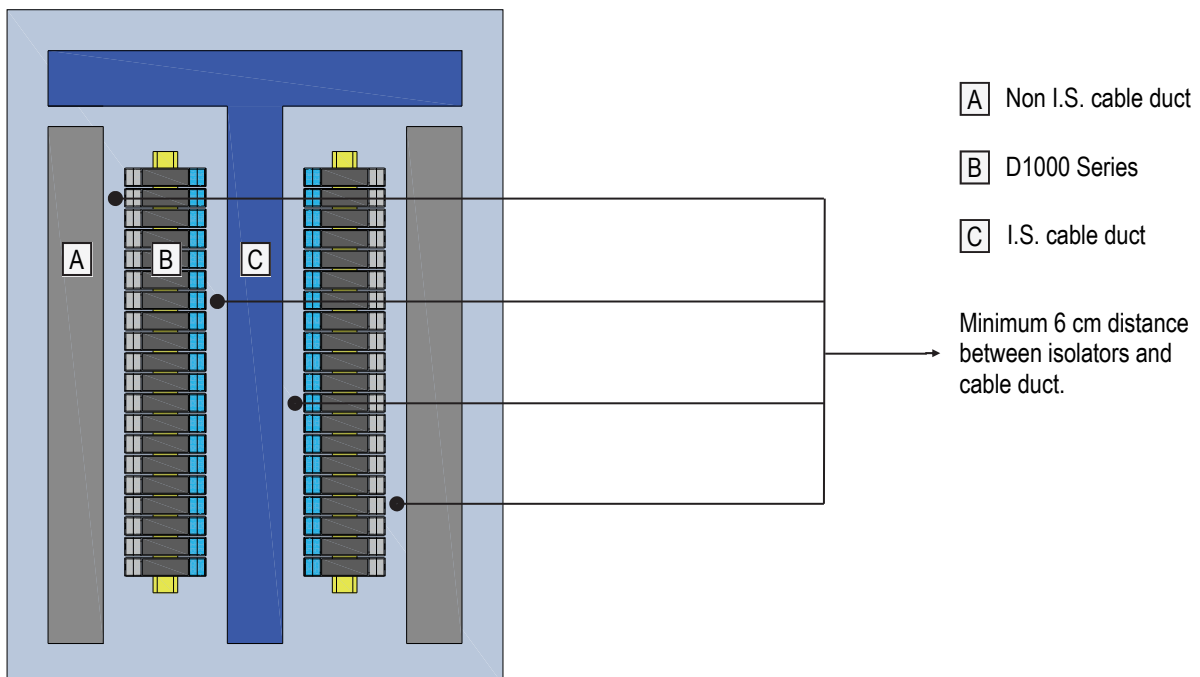
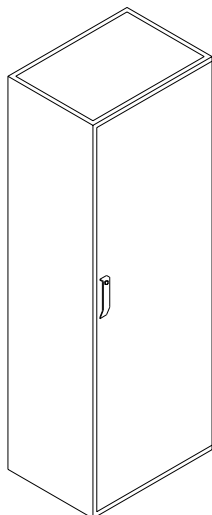


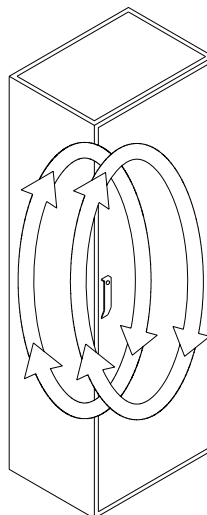
Fig. 2 Vertical orientation in the cabinet

**CLOSED VERSION**

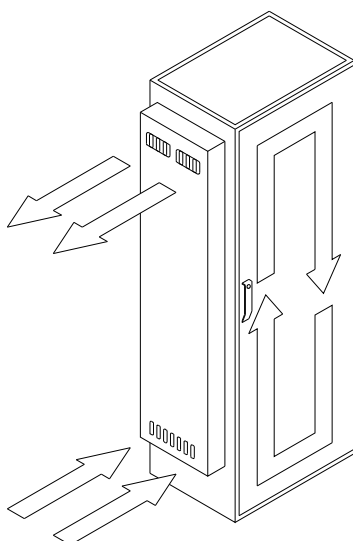
Natural convection  
~ 250 - 300 W



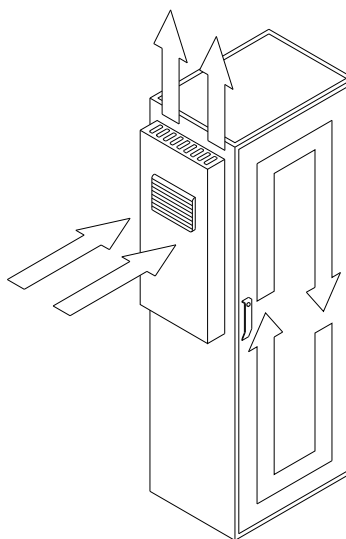
Forced convection by  
Internal fan (increasing  
In natural convection)  
~ 250 - 300 W



Forced air circulation  
via heat exchanger  
(air circulation by two  
separate flows internal  
and external)  
~ 1000 W



Heat dissipation a via air  
conditioner (cooling by  
temperature lower than  
the ambient temperature  
~ 500 W

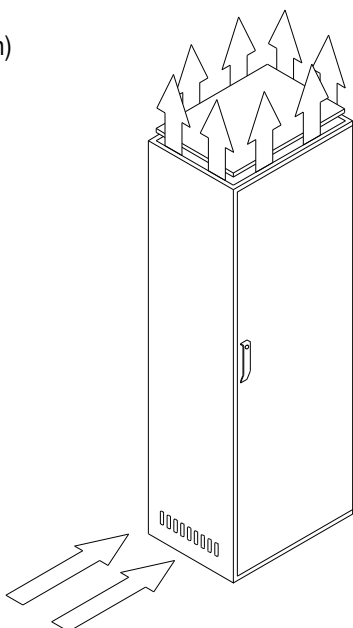


Power value dissipated per  $\Delta T = 10K$  (single cabinet)

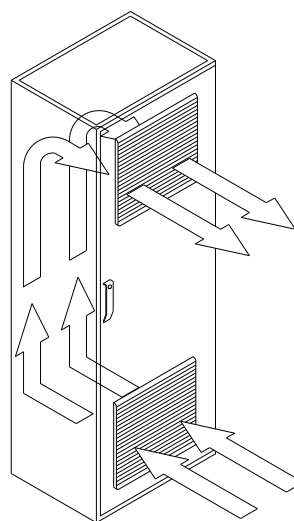
For installation in a row of cabinets, power dissipated in the first two examples is decreased of about 15%

**OPEN VERSION**

Air flow  
(Natural convection)  
~ 320 - 350 W



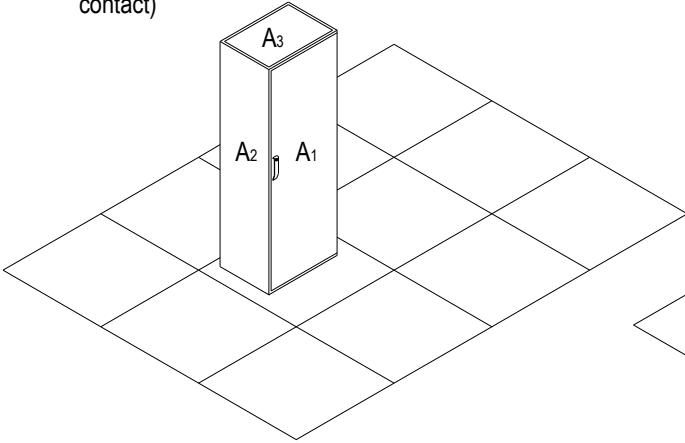
Air flow  
(filtered fans)  
~ 1000 W



Power value dissipated per  $\Delta T = 10K$  (single cabinet)

For installation in a row of cabinets, power dissipated in the above two examples is decreased of about 5-10%

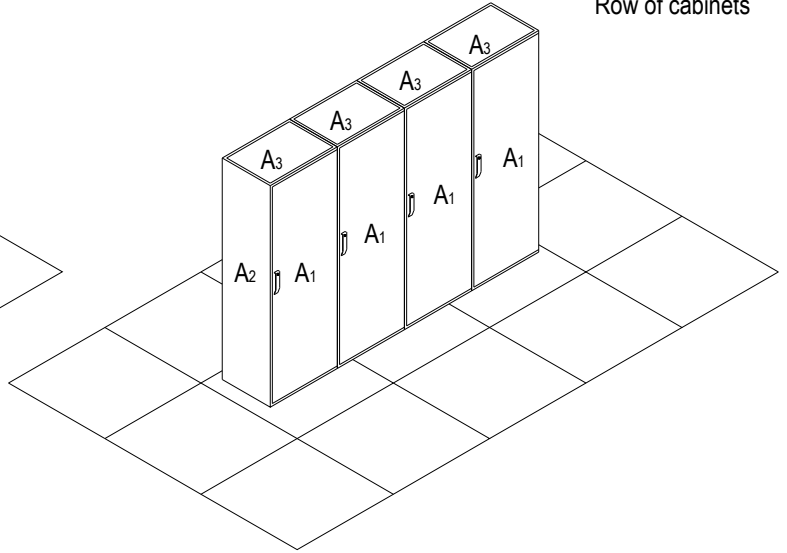
Single cabinet  
(all surfaces free of contact)



$$A_{TOT} = 1 \times A_1 + 2 \times A_2 + A_3$$

Formula for cabinet with no surfaces in contact with the wall

Row of cabinets

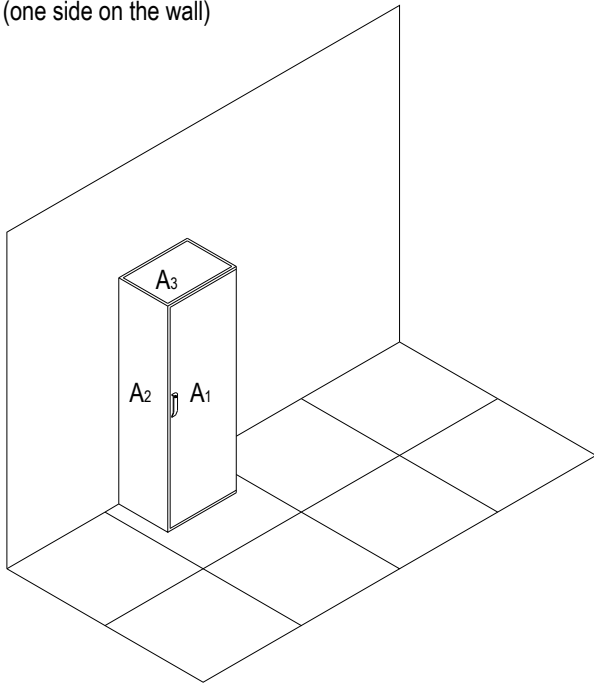


$$A_{TOT} = 2 \times N \times A_1 + 2 \times A_2 + N \times A_3$$

(N = Number of cabinets placed side by side)

Formula for row of cabinets with no surface in contact with the wall

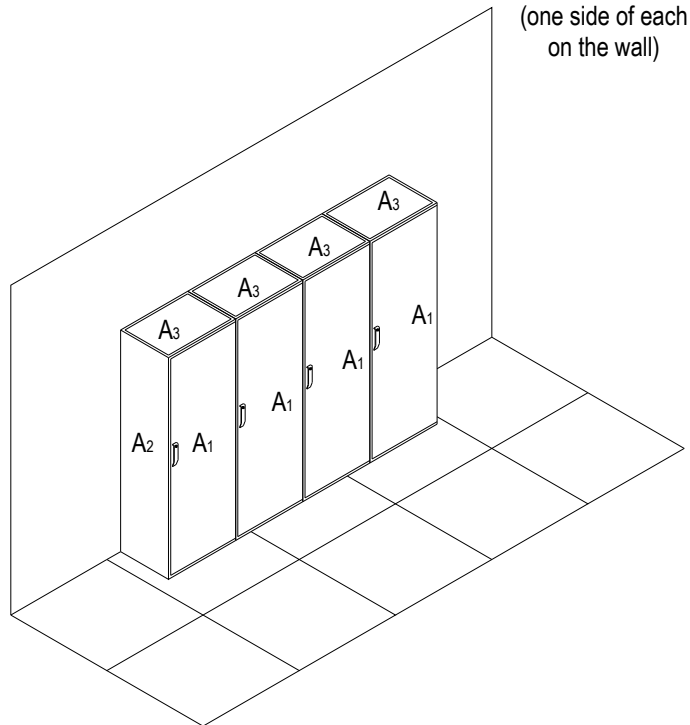
Single cabinet  
(one side on the wall)



$$A_{TOT} = 1 \times A_1 + 2 \times A_2 + A_3$$

Formula for cabinet with one side on the wall

Row of cabinets  
(one side of each on the wall)



Row of cabinet (one side by the wall)

$$A_{TOT} = 1 \times N \times A_1 + 2 \times A_2 + N \times A_3$$

Formula for row of cabinets with one side on the wall

### Intrinsically Safe products

**G.M. International's** products have been granted IS certificates from the most credited Notified bodies in the world. Certificates are available for ATEX (Europe), IECEx (International), Russian and Ukrainian standards, USA and Canada.

Certificates have been integrally scanned and are available for download from our website.



### SIL Certifications according IEC 61508 and IEC 61511

**G.M. International** offers a wide range of products that have been proved to comply with the most severe quality and safety requirements. IEC 61508 and IEC 61511 standards represent a milestone in the progress of industry in the achievement of supreme levels of safety through the entire instrumented system lifecycle.

The majority of our products are SIL certified; reports and analyses from TUV and EXIDA are available for download from our website.



### Marine Type Approval

**G.M. International** offers Type Approval Certificates for its line of Intrinsically Safe Isolators D1000 Series and Power Supplies for use in Marine and Offshore applications.

Certificates have been released both by Korean Register of Shipping and Det Norske Veritas.



### Company Quality System

**G.M. International's** Production Quality System is certified by Det Norske Veritas (Norway) to be compliant with ATEX 94/9/EC Directive and ISO 9001/2000.

This means our production facilities are periodically re-assessed throughout the whole manufacturing process, to ensure that the highest quality standards are met.



## Storage

If after an incoming inspection the unit is not installed directly on a system (parts for spare or expansion with long storage periods) it must be conveniently stocked. Stocking area characteristics must comply with the following parameters: Temperature:  $-20$  to  $+60$  °C, the  $-45$  to  $+80$  °C in the data sheet is meant for limited periods, mainly to arrange for air transport,  $-10$  to  $+30$  °C are preferred. Humidity: 0 to 90 %, long period high humidity affects the package integrity, 0 to 60 % humidity is preferred. Vibration: no prolonged vibration should be perceivable in the stocking area to avoid loosening of parts or fatigue ruptures of components terminals. Pollution: presence of pollutant or corrosive gases or vapors must be avoided to prevent corrosion of conductors and degradation of insulating surfaces.

## Disposal

The product should not be disposed with other wastes at the end of its working life. It may content hazardous substances for the health and the environment, to prevent possible harm from uncontrolled waste disposal, please separate this equipment from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. This product should not be mixed with other commercial wastes for disposal. In each case the product must be disposed in compliance with the applicable laws and guidelines of the respective country.

## Maintenance and Repair

Series D1000 modules do not require particular maintenance under normal operating conditions. They are designed to operate trouble free and with high stability for long time. If a unit is found not meeting specifications or in a failure condition then it requires recalibration or servicing. Any repair made by unauthorized personnel may completely invalidate the safety characteristics of the card. Repair not made by GM. International is prohibited. If a barrier failure condition is actually found, replace the defective card with a good one and send it for repair to the nearest authorized representative of GM International.