

INSTRUCTION MANUAL

D5000 - D5200 SERIES

DIN-RAIL, POWER BUS,
TERMINATION BOARD MOUNTING

**INTRINSICALLY SAFE ISOLATORS
AND SAFETY RELAYS**

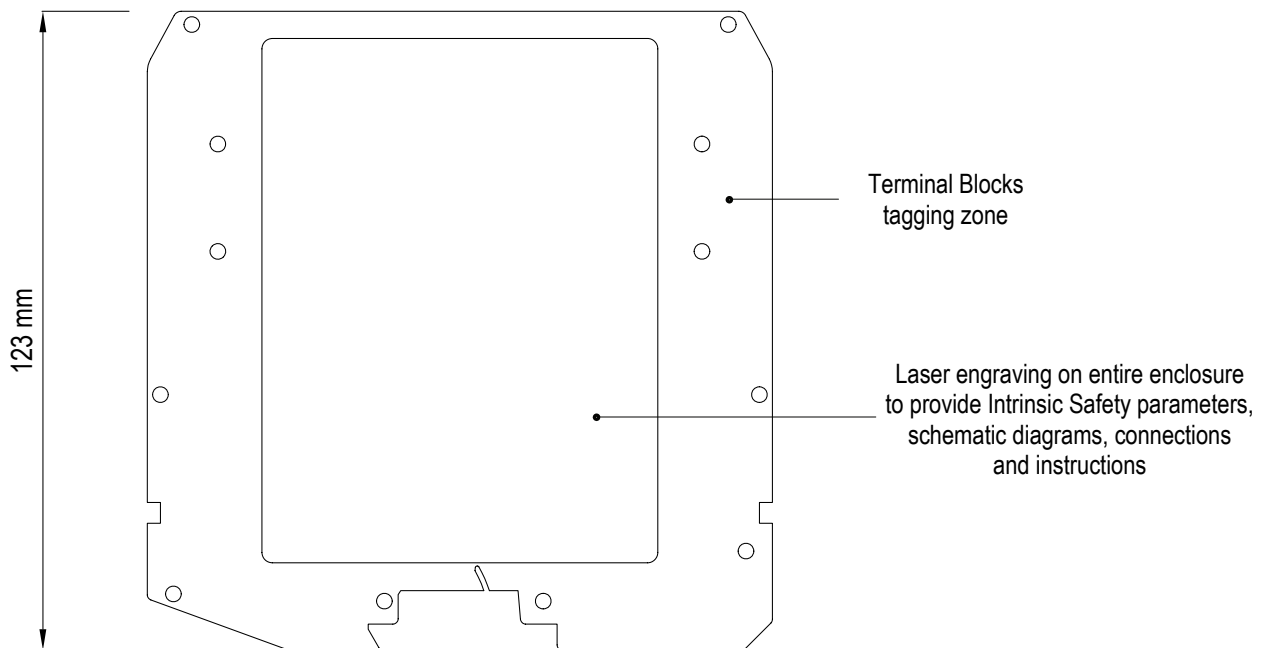
D5000 - D5200 Intrinsically Safe Isolators and Safety Relays

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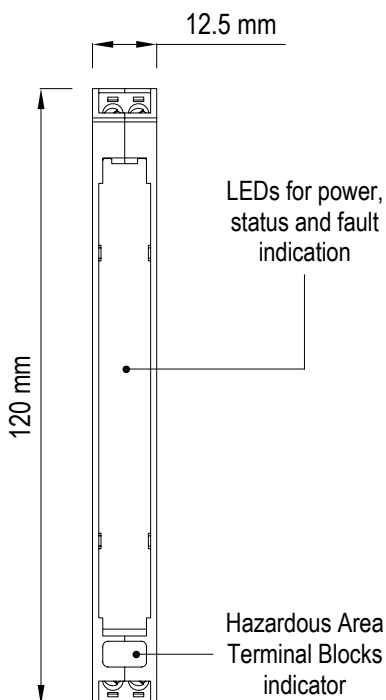
Mechanical features

Mounting	Dimensions (D5000)	Dimensions (D5200)
T35 DIN-Rail according to EN50022 with or without Power Bus connector or on Termination Board	Width 12.5 mm Depth 123.0 mm Height 120.0 mm	Width 22.5 mm Depth 123.0 mm Height 120.0 mm
Case material	Blister packing size (D5000)	Blister packing size (D5200)
PA66 - Polyamide (Nylon) 66	Width 24.0 mm Depth 132.0 mm Height 138.0 mm	Width 34.0 mm Depth 132.0 mm Height 138.0 mm

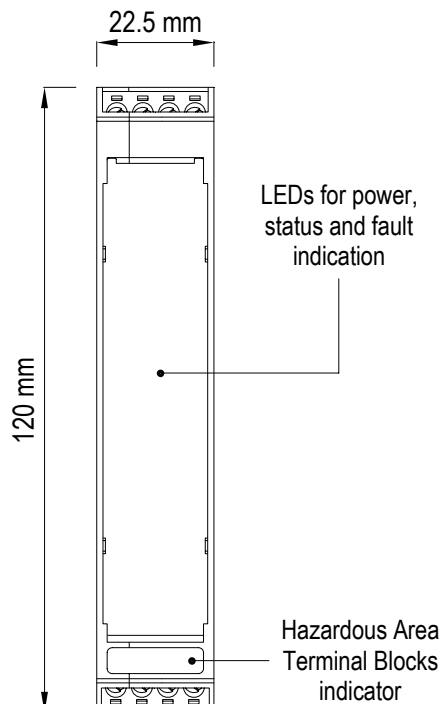
Side D5000 - D5200



Front D5000



Front D5200



Enclosure Characteristics

- High channel density results from innovative circuit design using advanced surface mount components.
- Plug-in screw terminal blocks to secure terminations up to 2.5 mm².
- Configuration components are easily accessed by removing side cover.

High packing density

- 35 mm (Top Hat) DIN-Rail.
- Ultra slim 2 channels 12 mm wide DIN-Rail and Termination Board mounting modules.
- Power and fault on bus connectors.
- 6 mm per channel means 50% space reduction.

Mounting

Fig. 1

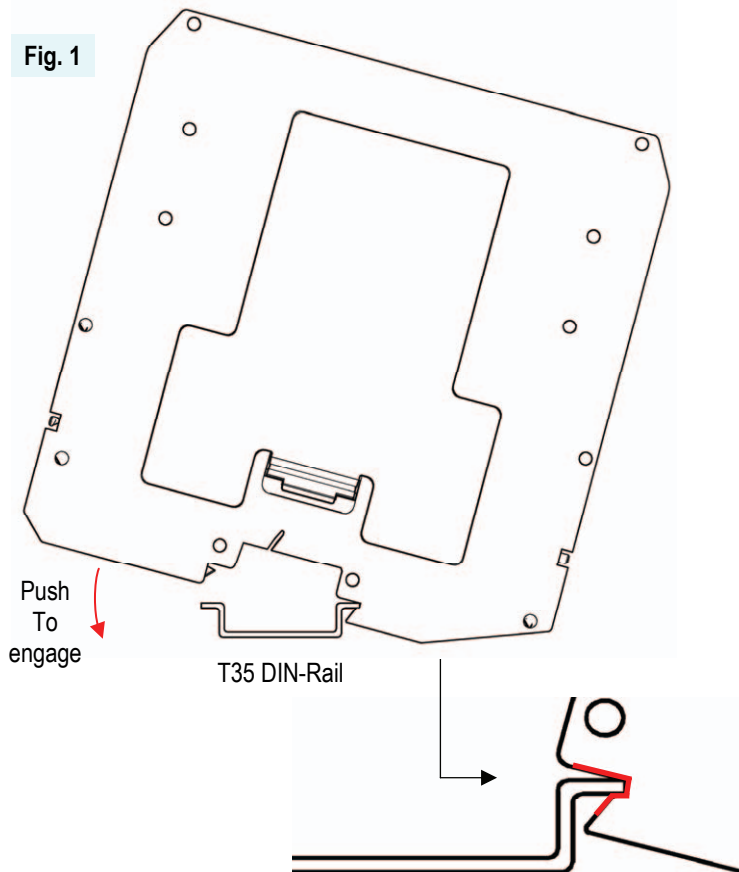
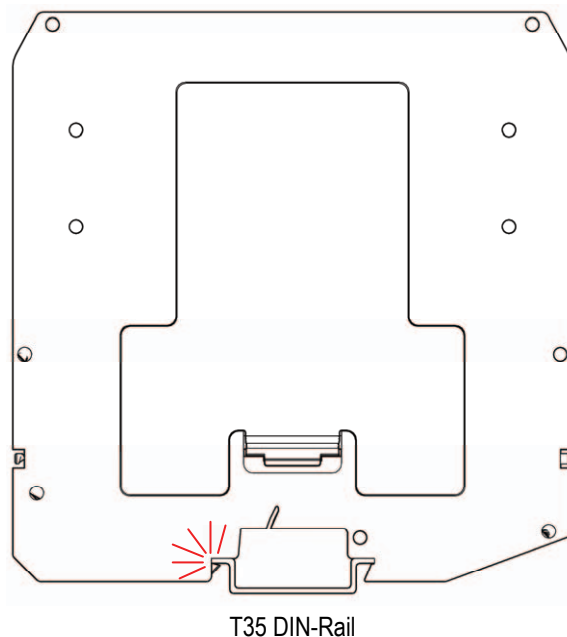


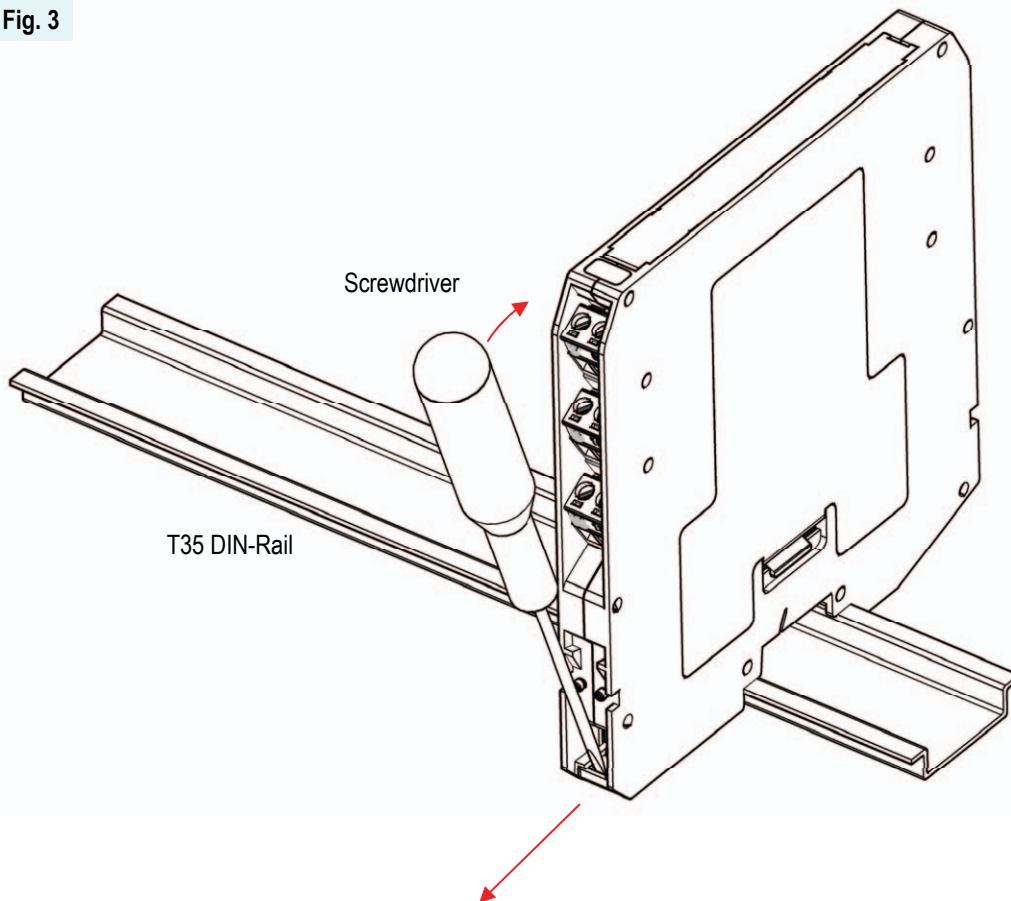
Fig. 2



To mount Series D5000-D5200 on 35 mm DIN-Rail, hook one side of the mounting foot over the rail's lip and press the barrier down firmly until fixed (see Fig.1 and Fig.2).

Removing

Fig. 3



To remove a barrier from the mounting rail, insert a blade screwdriver in the mounting foot and lever against the side of the barrier casing (see Fig.3 and Fig.4).

Fig. 4

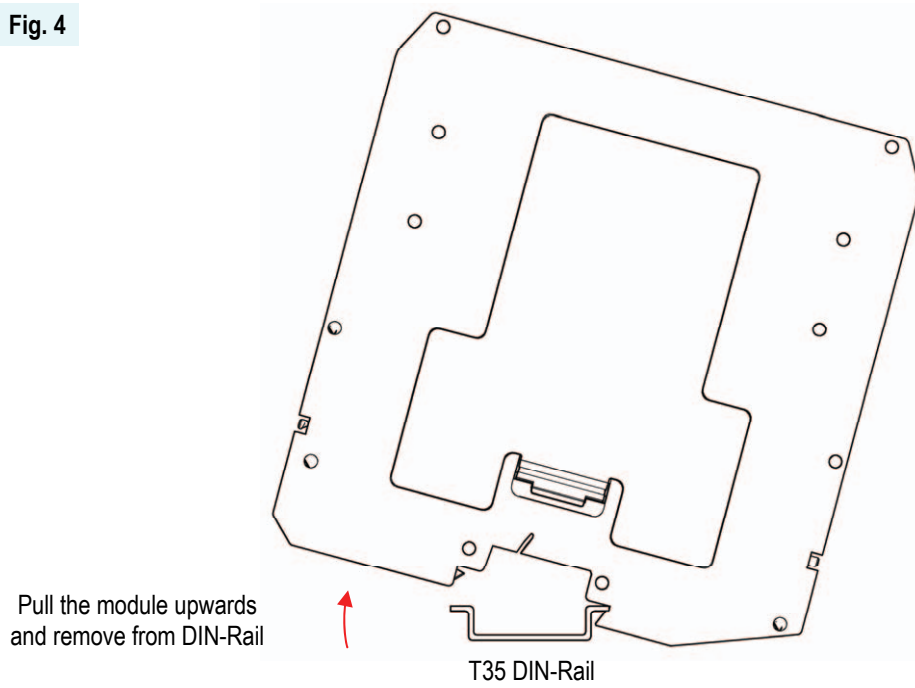


Fig. 5 T35 DIN-Rail

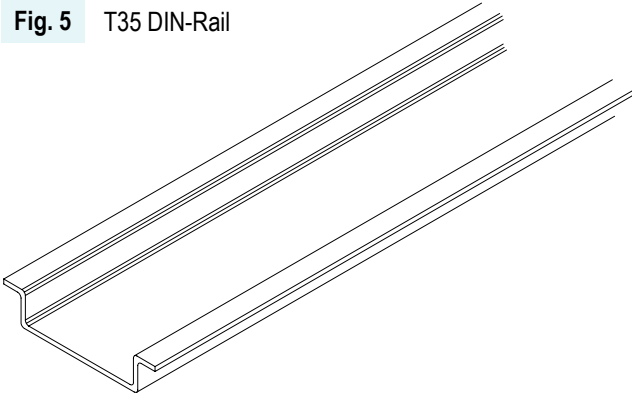
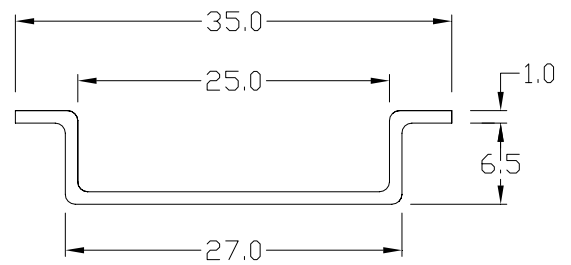


Fig. 6 T35 DIN-Rail Dimensions (millimeters)



Power Bus connector

Power Supply Voltage 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 standard DIN-Rail modules mounted on optional DIN-Rail Power Bus connectors. The maximum allowed powering capacity is 8 A. It is always possible to remove modules, without disconnecting the bus connector which remains attached to the DIN-Rail.

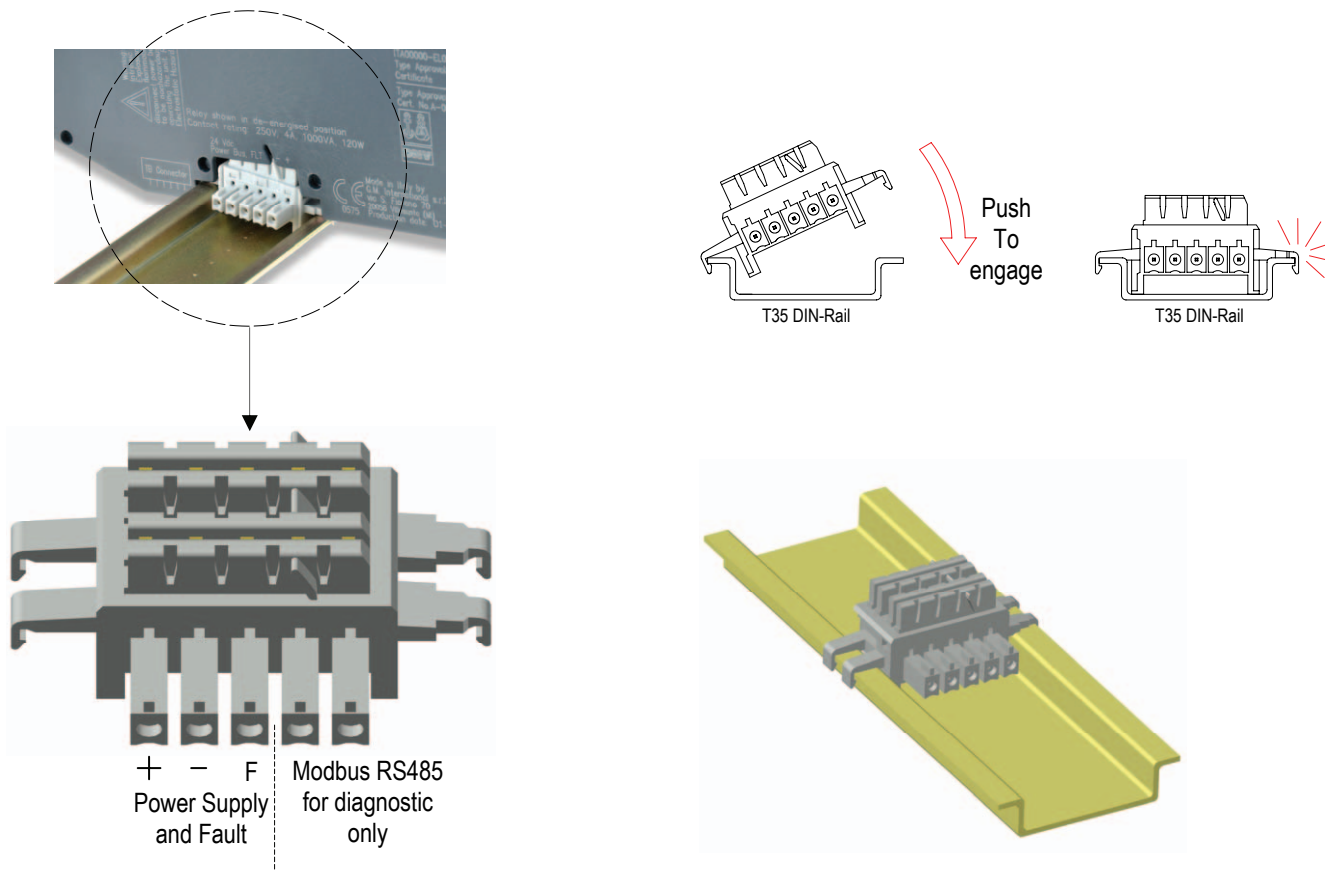
Cumulative Fault Alarm indication is provided on the Power Bus connection. This signal is in common with the supply and typically fed to a common unit D5001S which provides:

- 1 SPST Relay contact for common faults and
- 1 SPST Relay contact for power good (supply within operating range).

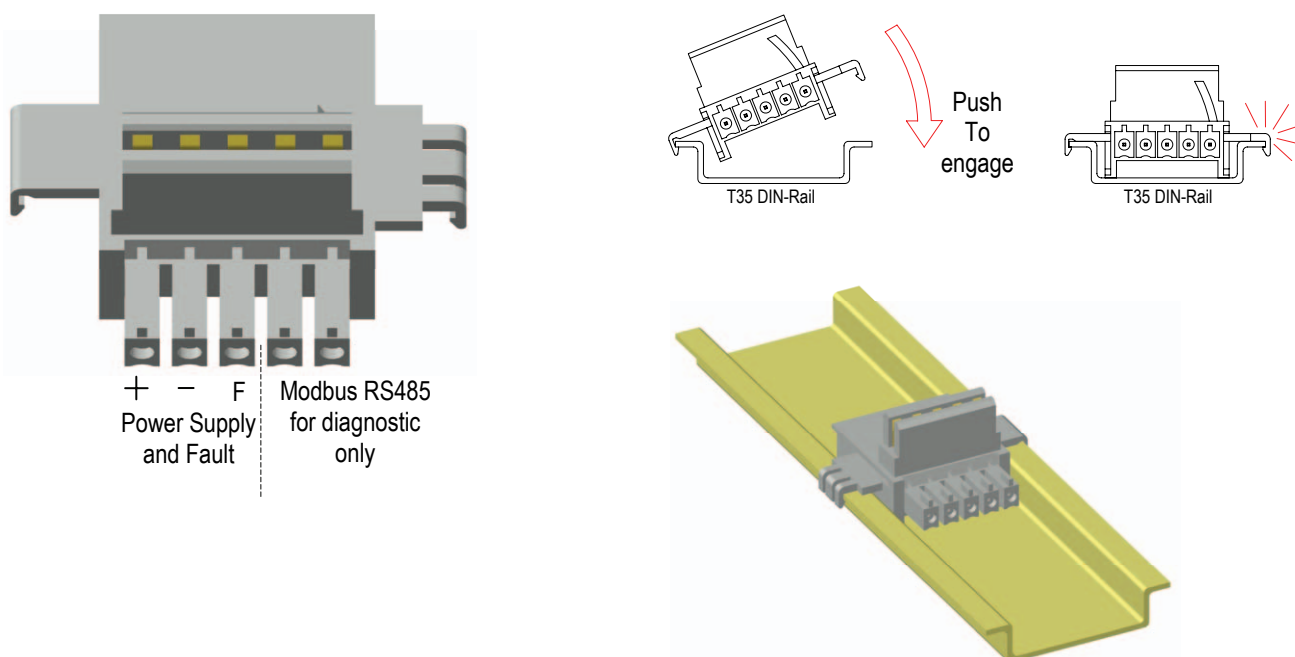
The D5002S is capable of operating also as redundant 4 A supply module for the system.

Power Bus system need the accessories shown below, in order to be operative:

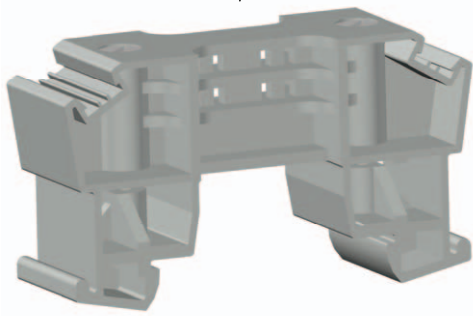
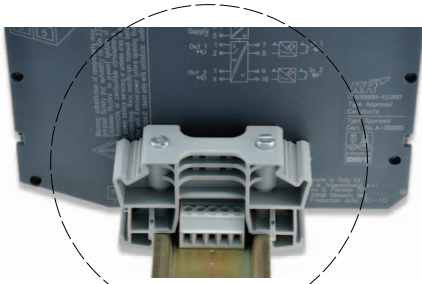
JDFT049: D5000 Power Bus Connector (12mm)



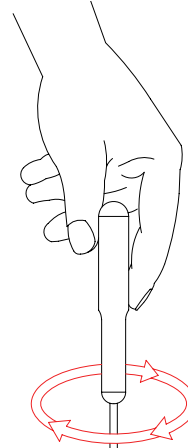
JDFT050: D5200 Power Bus Connector (22mm)



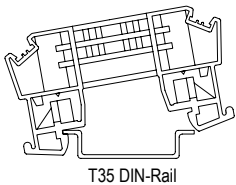
MCHP196: DIN-Rail Stopper



DIN-Rail Stopper (MCHP196)

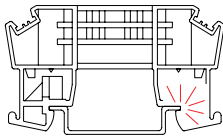


Secure the stopper to the rail by completely rotating both screws clockwise.

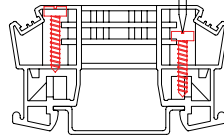


T35 DIN-Rail

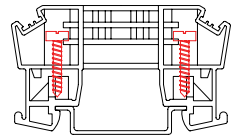
Push To engage



T35 DIN-Rail



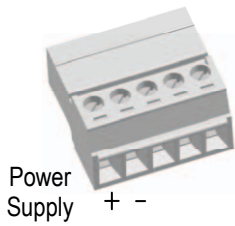
T35 DIN-Rail



T35 DIN-Rail

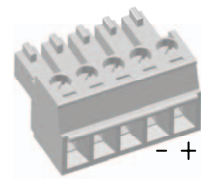
MOR022, MOR017: Plug-in terminal blocks

Plug-in terminal block male, horizontal out, for Power Bus (MOR022)

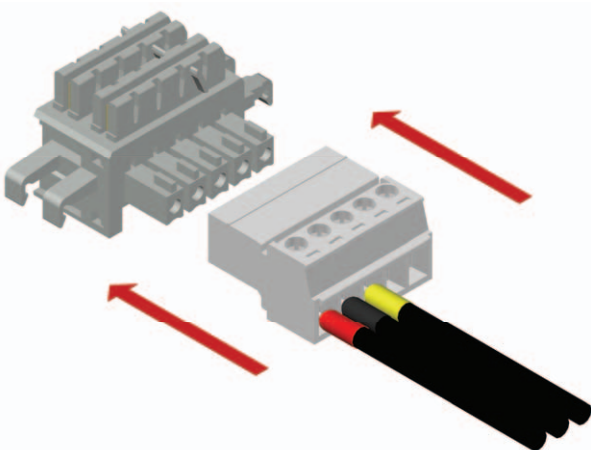


Power Supply + -

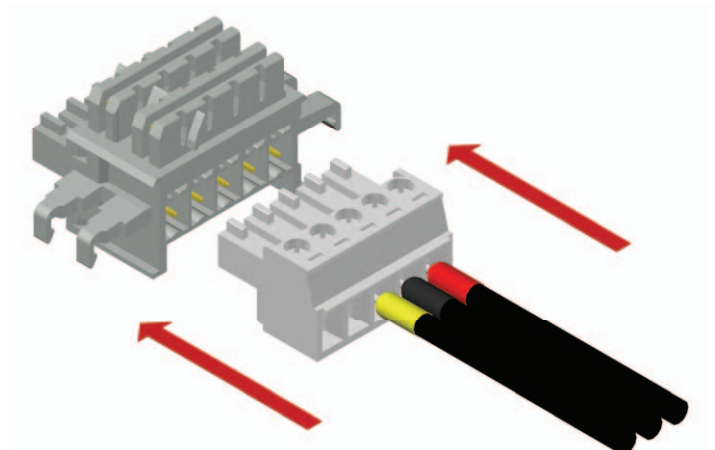
Plug-in terminal block female, horizontal out, for Power Bus (MOR017)



- + Power Supply



Mounting a plug-in terminal block male onto a connector Power Bus

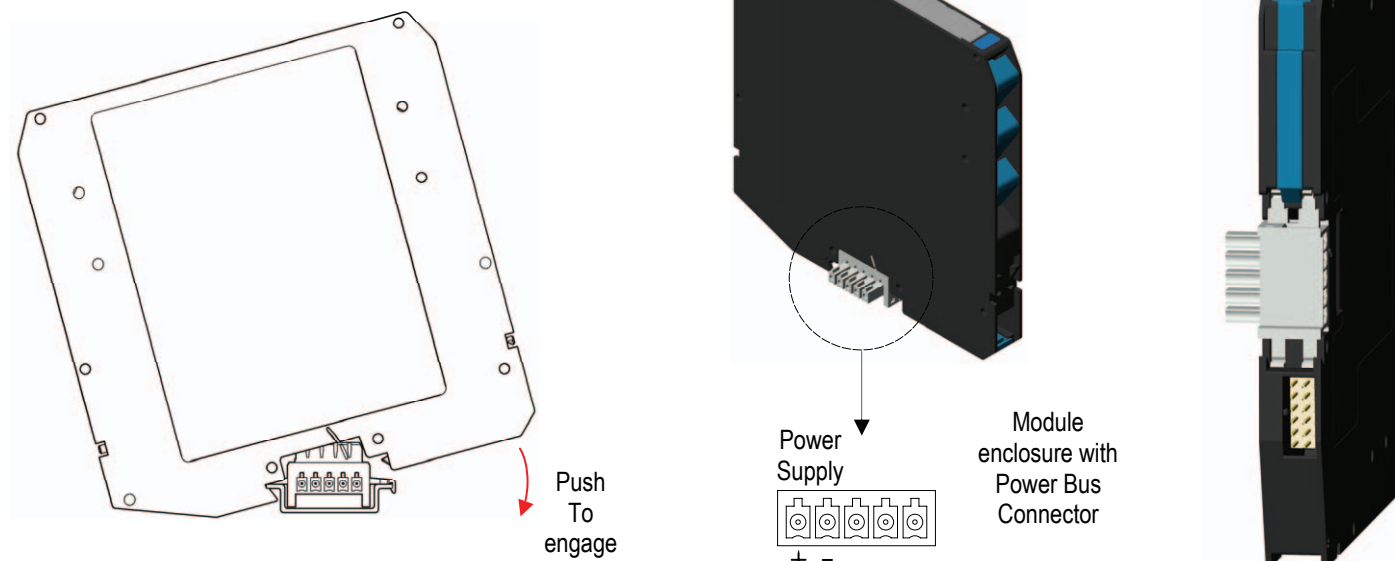


Mounting a plug-in terminal block female into a connector Power Bus

Mounting modules on Power Bus connector

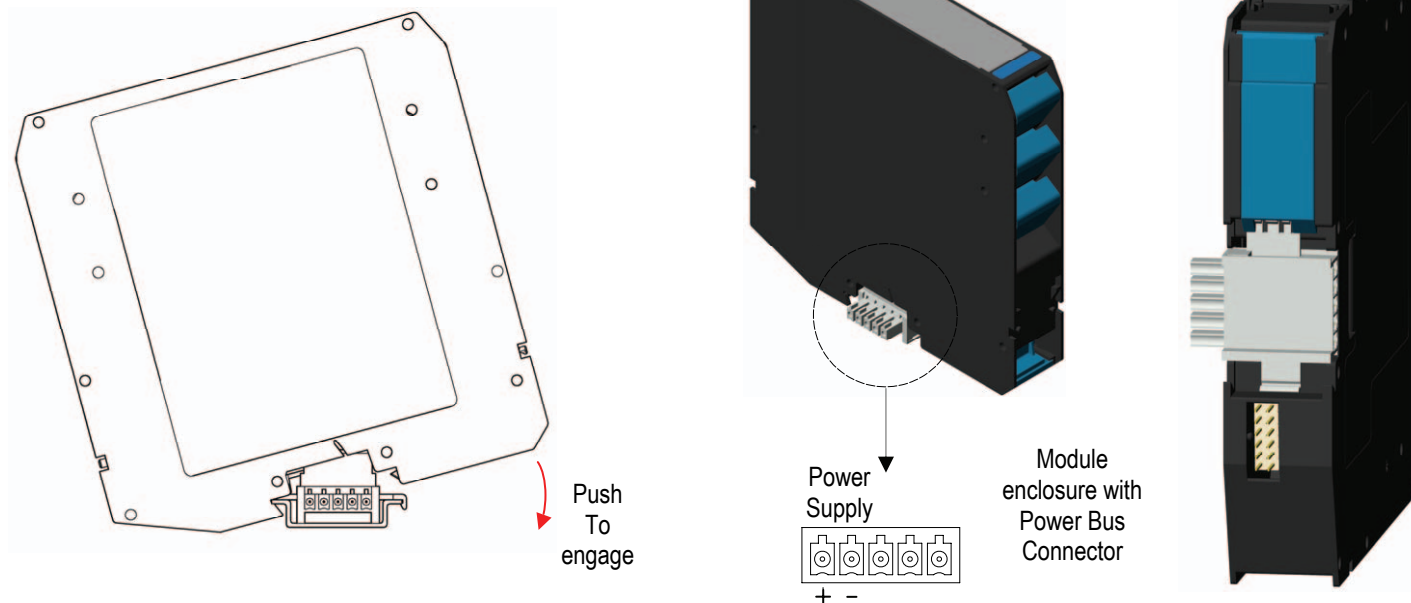
D5000 Series

Mounting a module onto Power Bus connector 12 mm and T35 DIN-Rail








D5200 Series

Mounting a module onto Power Bus connector 22 mm and T35 DIN-Rail

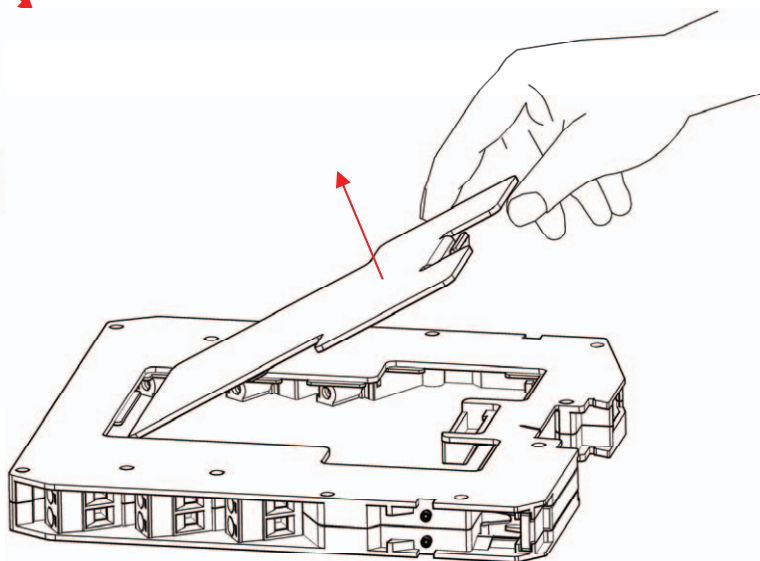
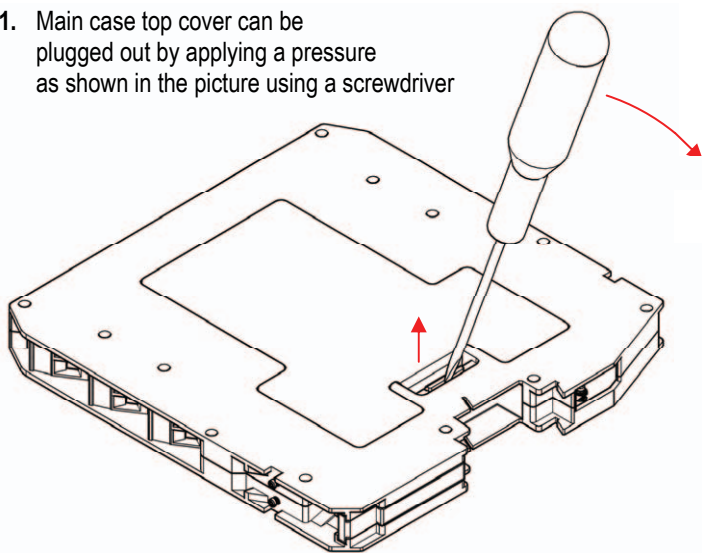


Ordering information

Image	Code	Description
	MCHP196	DIN-Rail Stopper
	MOR017	Plug-in terminal block female, horizontal out, for Power Bus
	MOR022	Plug-in terminal block male, horizontal out, for Power Bus
	JDFT049	Connector 5 pin Power Bus 12mm DIN-Rail
	JDFT050	Connector 5 pin Power Bus 22mm DIN-Rail

Removing

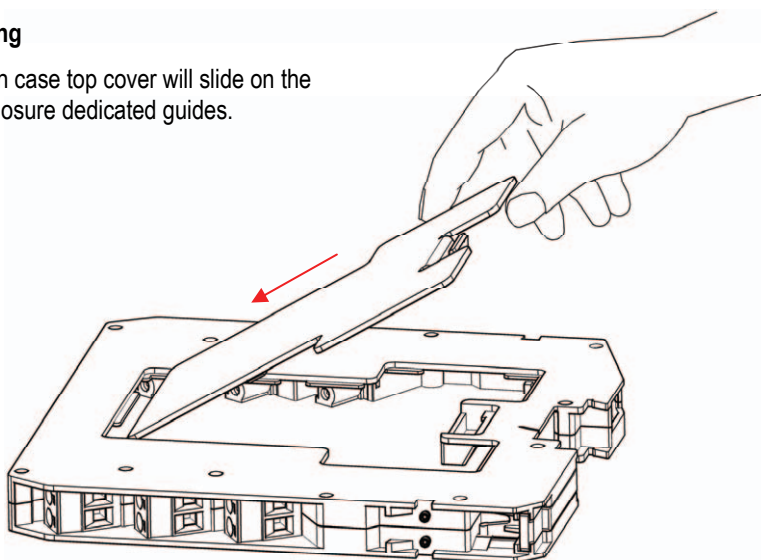
1. Main case top cover can be plugged out by applying a pressure as shown in the picture using a screwdriver



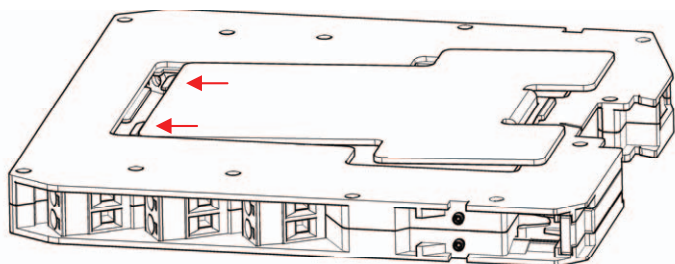
2. Pull firmly main case top cover as shown in the picture.

Mounting

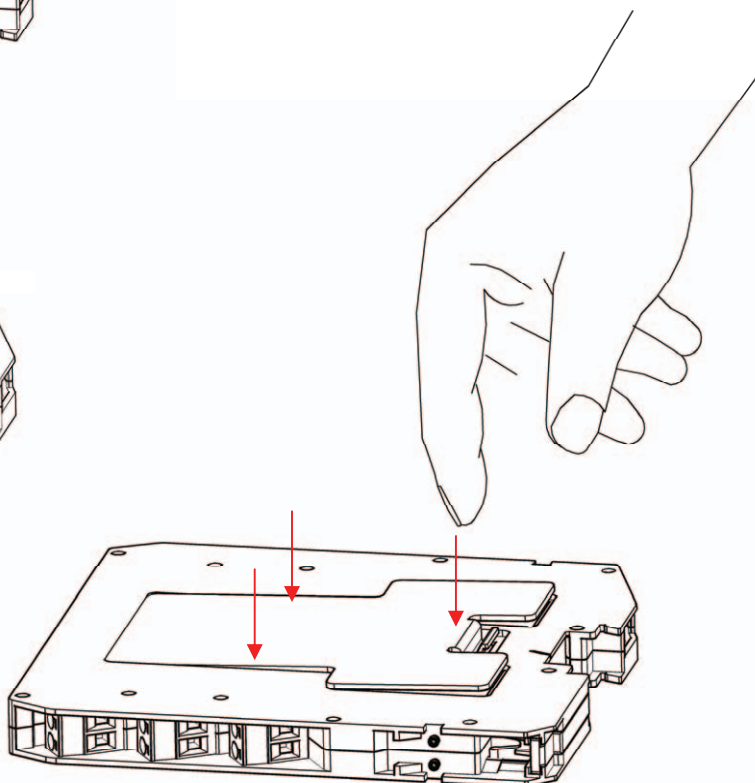
1. Main case top cover will slide on the enclosure dedicated guides.

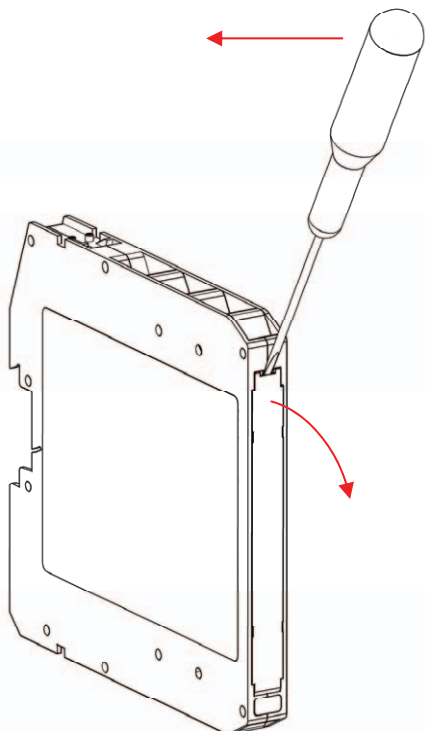


2. Completely slide main case top cover to the enclosure guides.



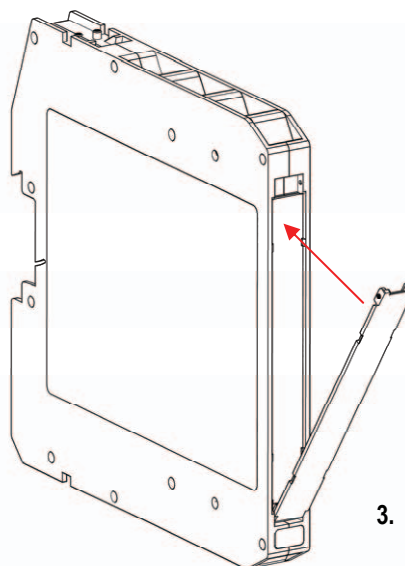
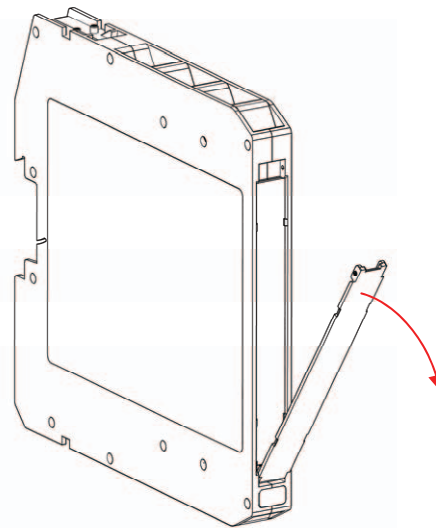
3. Press firmly main case top cover as shown by arrows in the picture.



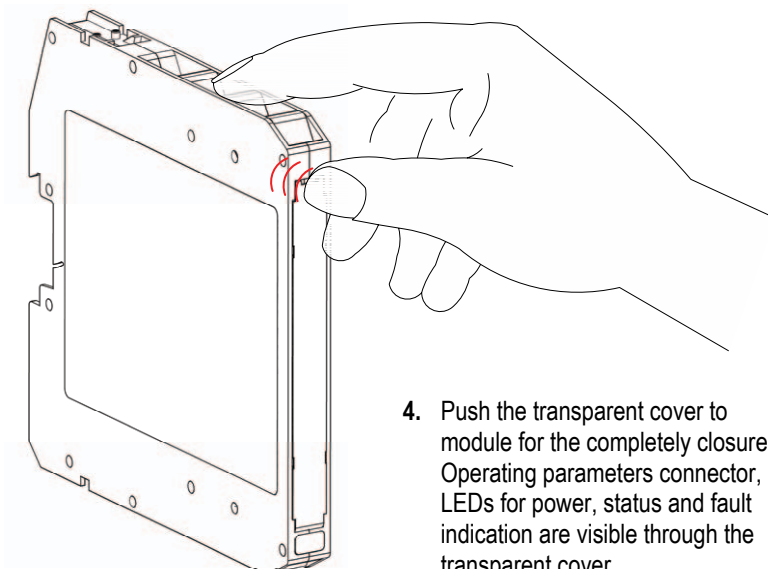


1. Open the transparent cover using a screwdriver as shown by arrows in the picture.

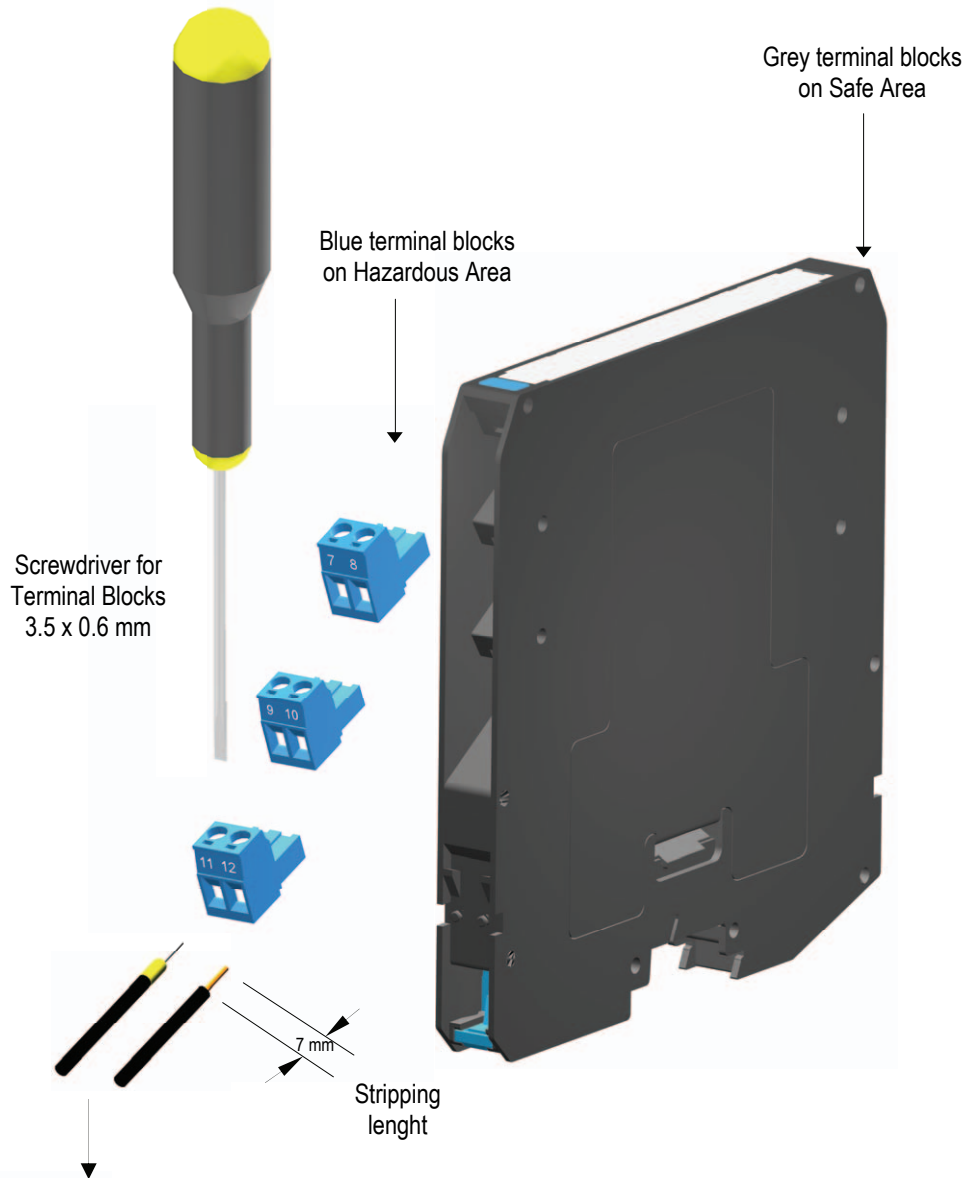
2. Open the transparent cover up to 90 degrees. For fully programmable modules, a dedicated connector is accessible and operating parameters are programmable by the GM Configurator PPC5092 via SWC5090 Configurator software.



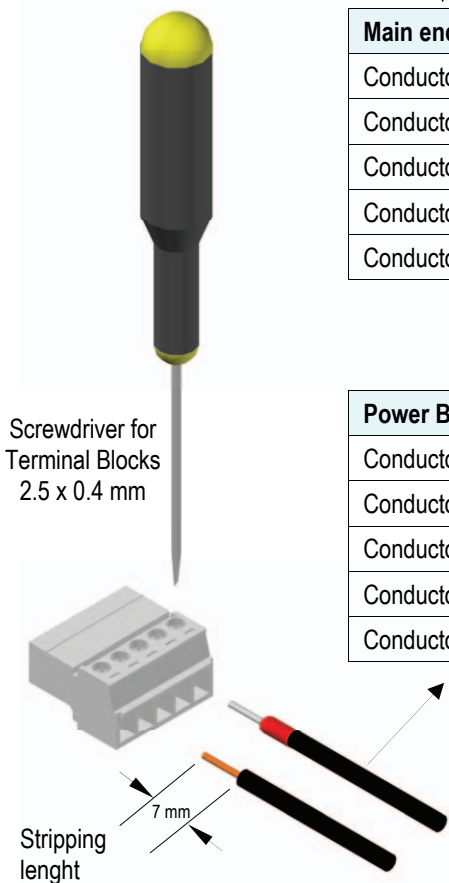
3. Close the transparent cover as shown in the picture.



4. Push the transparent cover to module for the completely closure. Operating parameters connector, LEDs for power, status and fault indication are visible through the transparent cover.

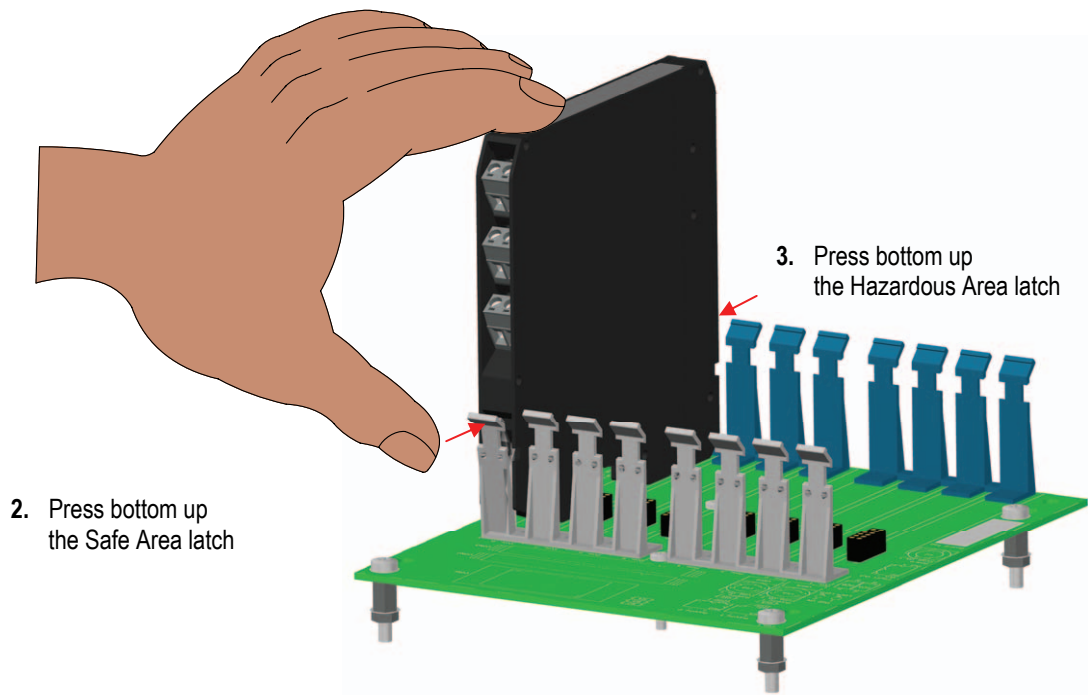
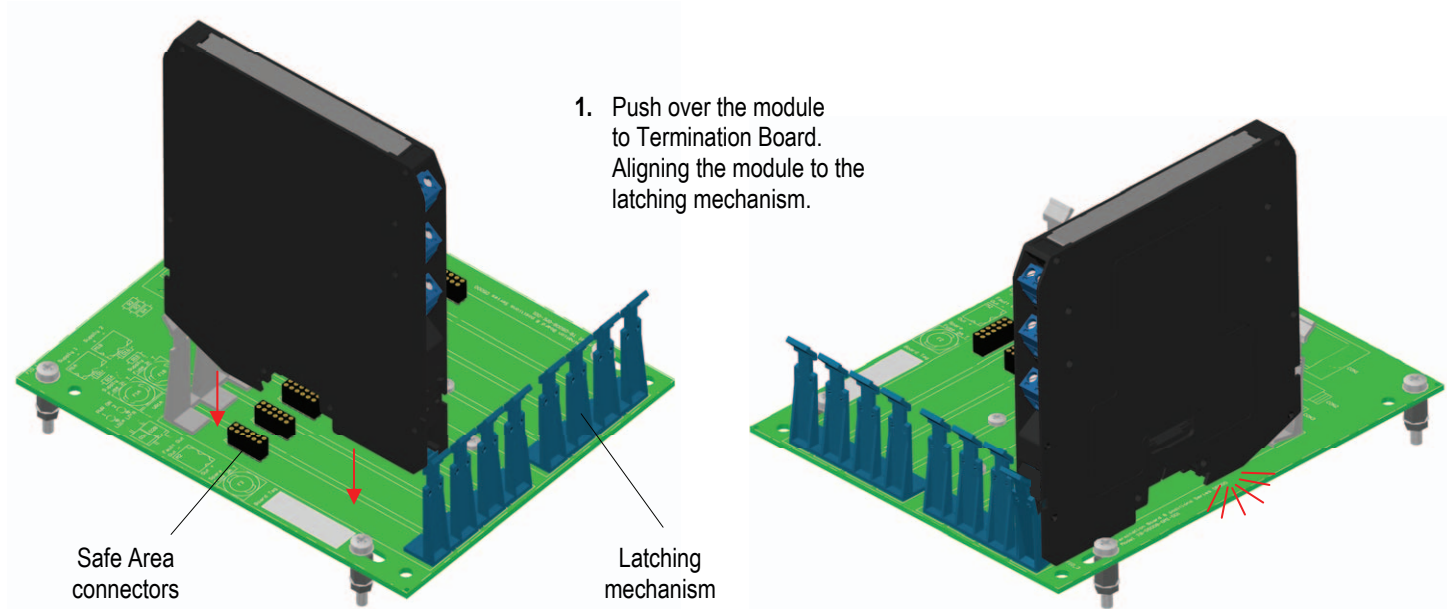


Main enclosure terminal block connection data	
Conductor cross section solid	From 0.2 mm ² to 2.5 mm ²
Conductor cross section stranded	From 0.2 mm ² to 2.5 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve	From 0.25 mm ² to 2.5 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve	From 0.25 mm ² to 2.5 mm ²
Conductor cross section AWG	From 24 to 12 AWG



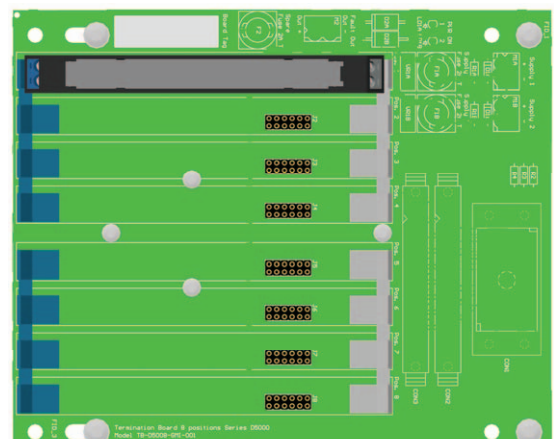
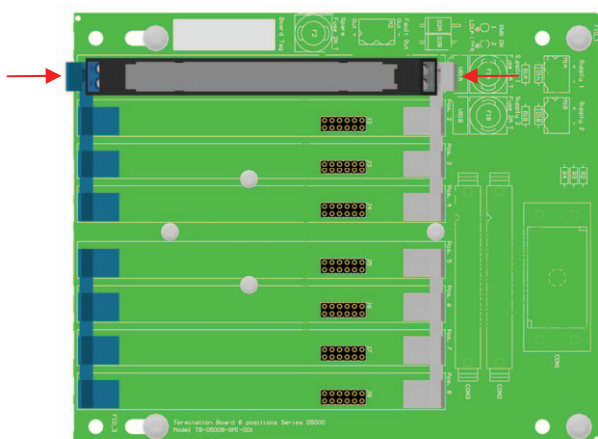
Power Bus terminal block connection data	
Conductor cross section solid	From 0.14 mm ² to 1.5 mm ²
Conductor cross section stranded	From 0.14 mm ² to 1.5 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve	From 0.25 mm ² to 1.5 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve	From 0.25 mm ² to 0.5 mm ²
Conductor cross section AWG	From 28 to 16 AWG

Mounting a module onto a Termination Board



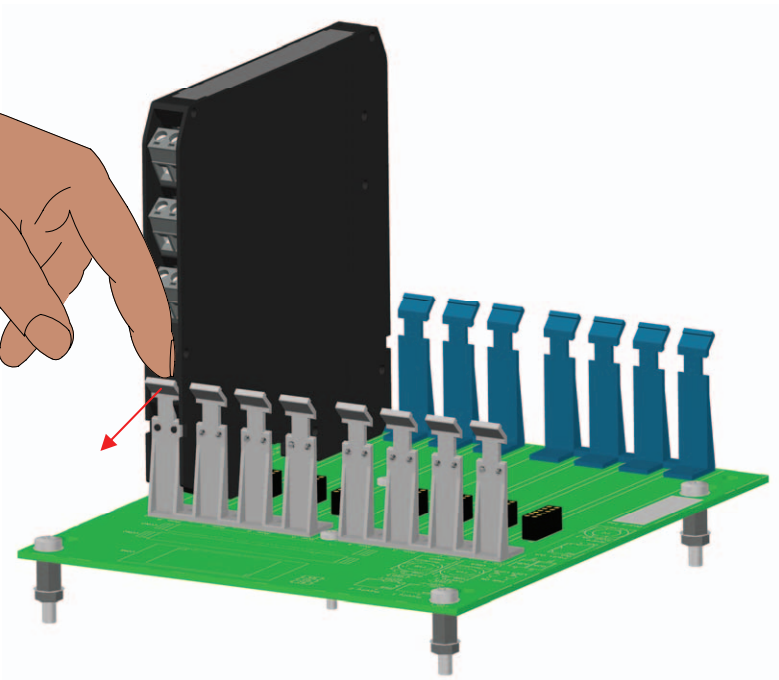
Latches position before pressure

Latches position after pressure

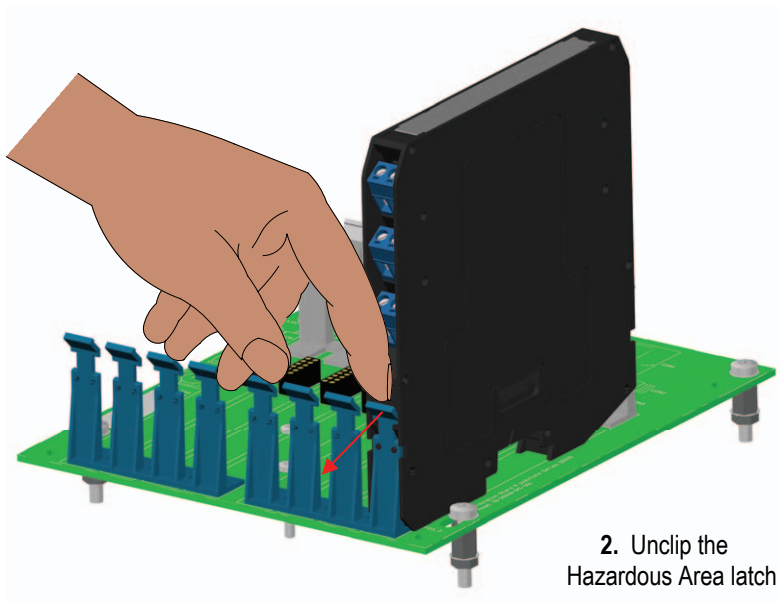


Removing a module from Termination Board

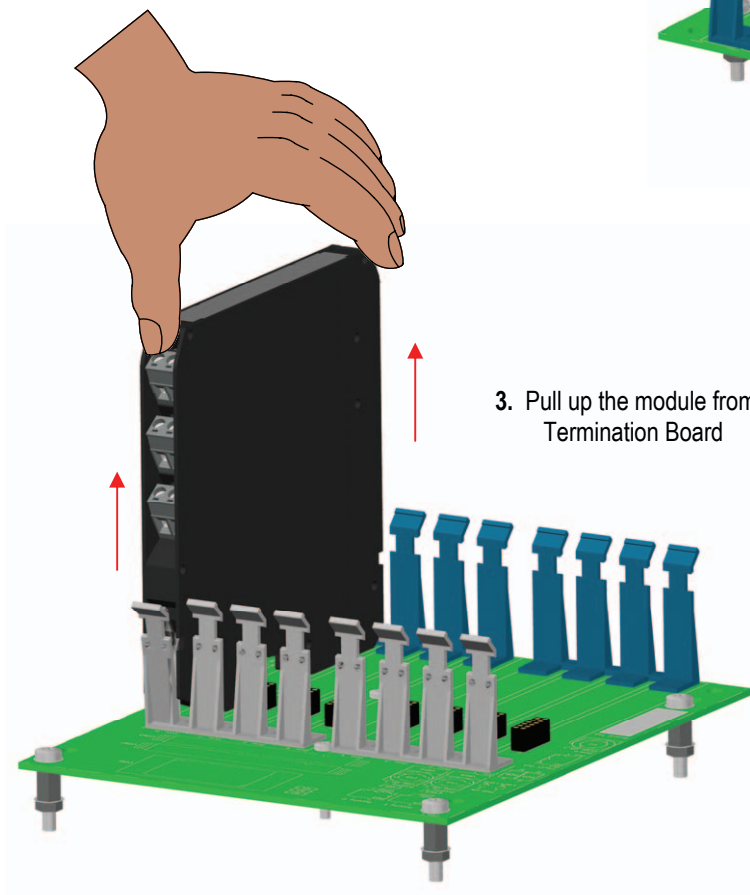
1. Unclip the Safe Area latch



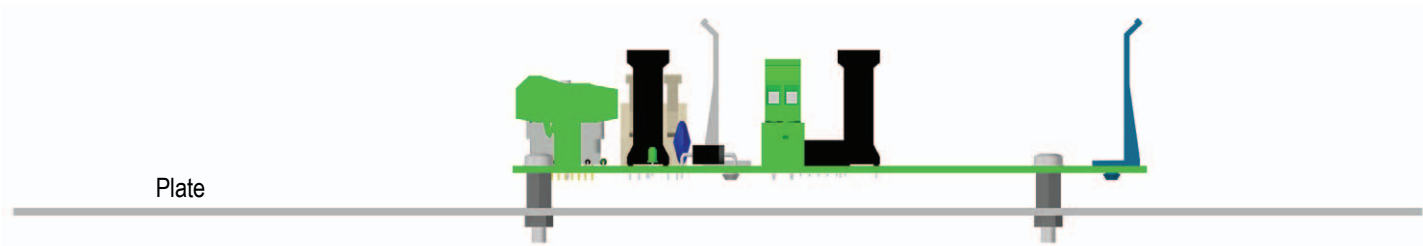
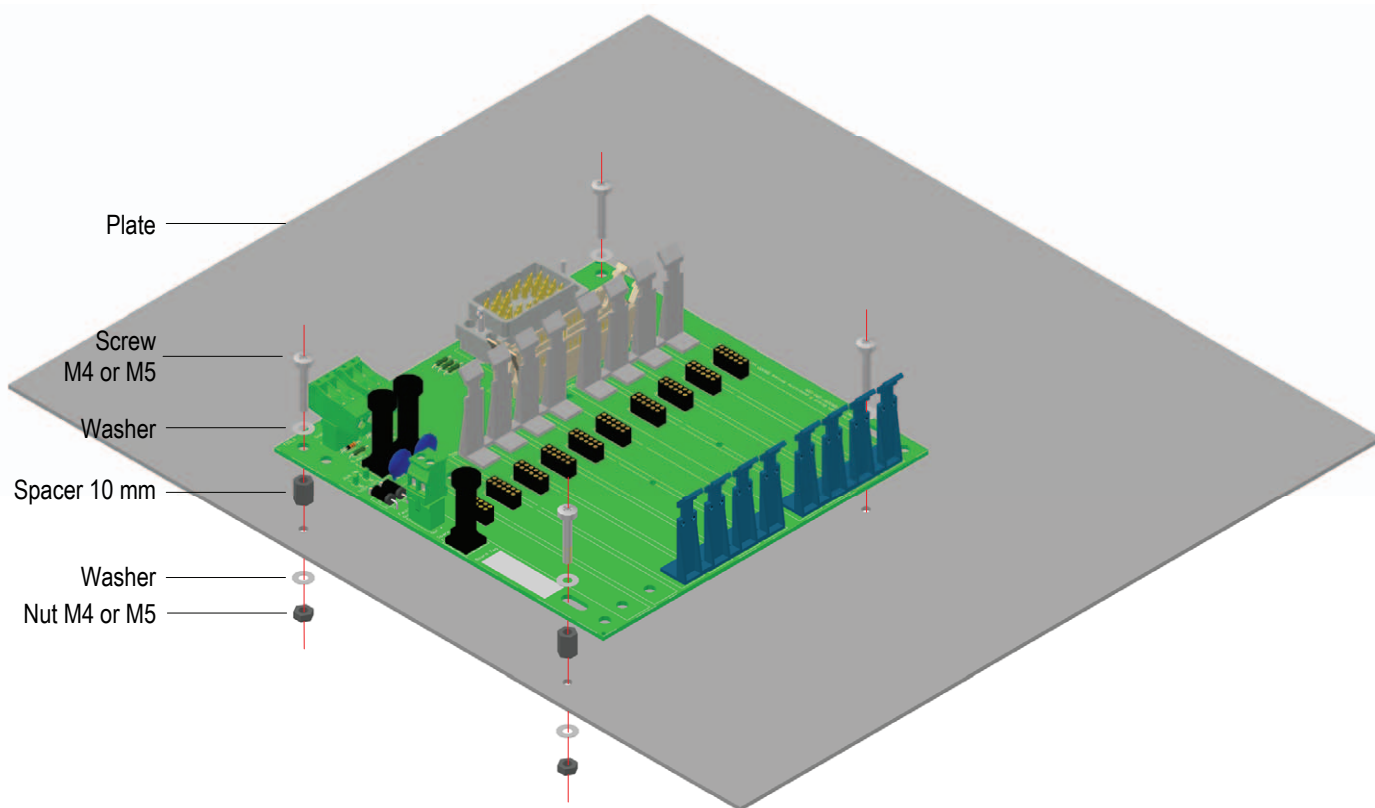
2. Unclip the Hazardous Area latch



3. Pull up the module from Termination Board



Mounting Termination Board



Mounting and removing Termination Board onto DIN-Rail

Mounting

Fig. 1

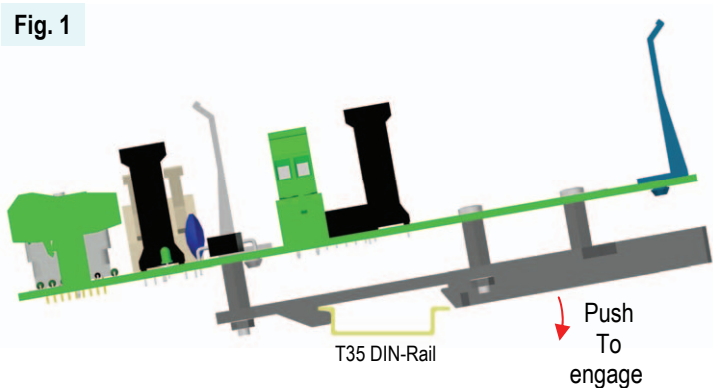
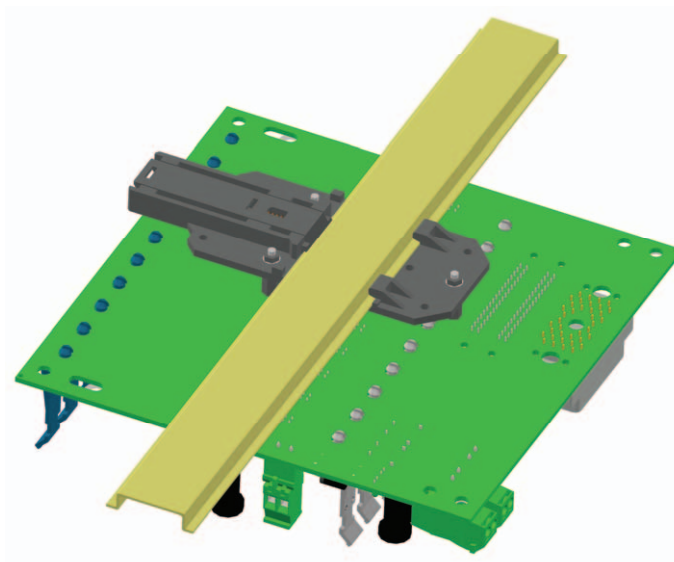
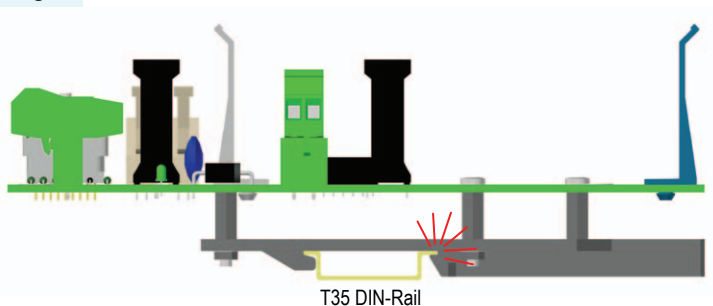


Fig. 2



To mount Termination Board on 35 mm DIN-Rail, hook one side of the mounting foot over the rail's lip and press the Termination Board down firmly until fixed (see Fig.1 and Fig.2).

Removing

To remove a Termination Board from the mounting rail, insert a blade screwdriver in the mounting foot and lever as shown in Fig.3.

Fig. 3

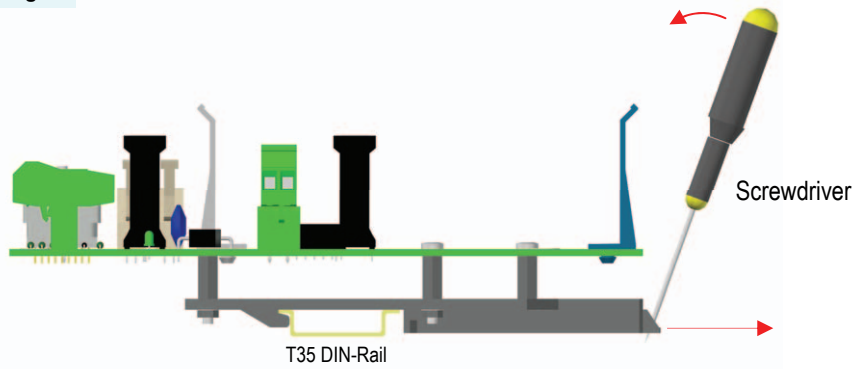
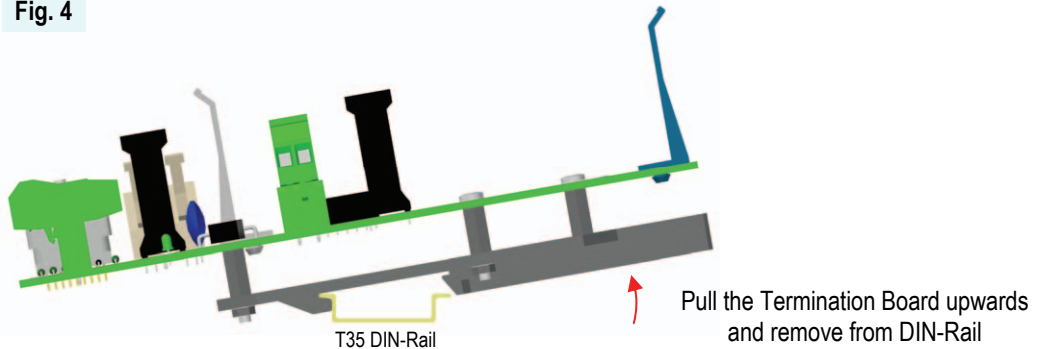
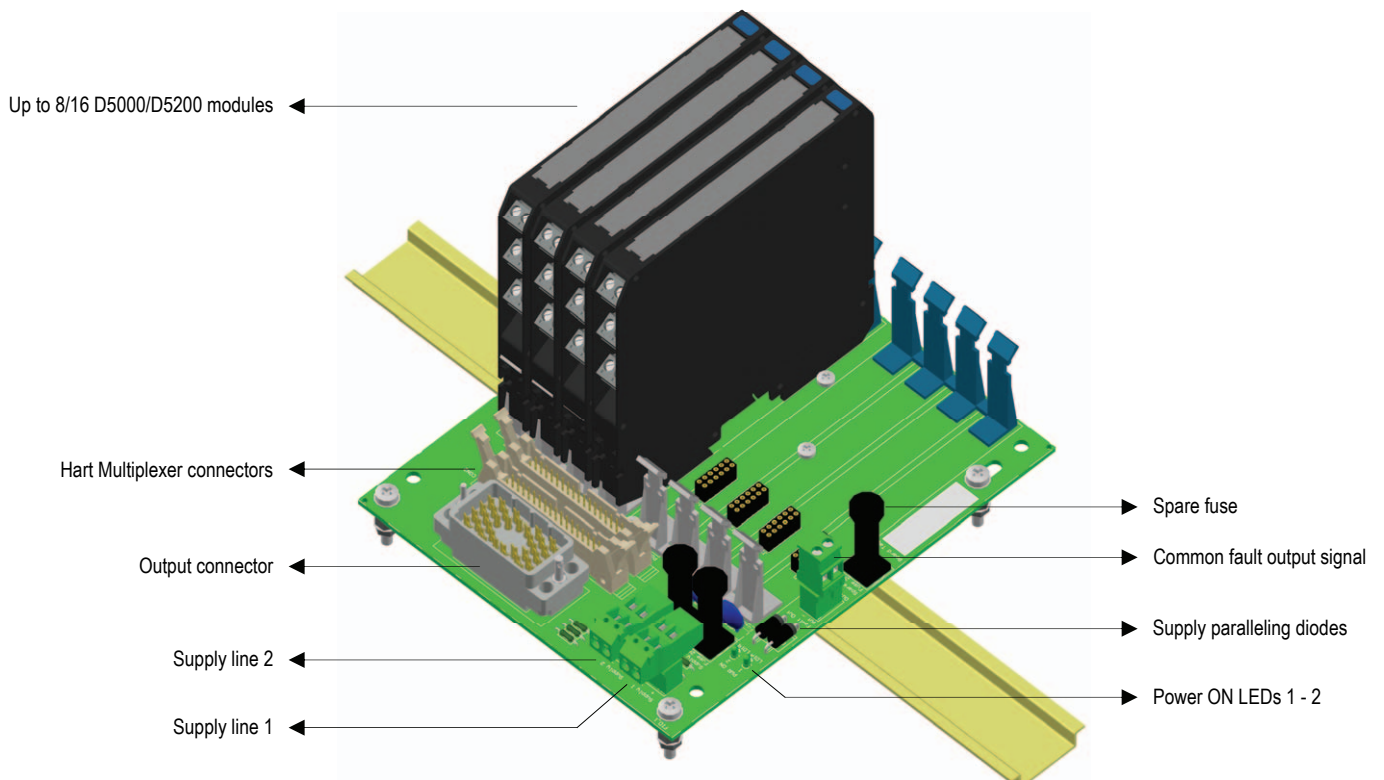


Fig. 4



Termination Boards characteristic

- ◆ Suitable to accept up to 8/16 D5000 or D5200 modules 12mm/22mm wide.
- ◆ 24 Vdc Power supply terminal blocks can be disconnected from the board without disconnecting the power to other boards connected in series.
- ◆ Boards are available with custom connectors for any system / PLC / DCS.
- ◆ Boards are available also for 8/16+2 modules: the extra 2 modules D5001S provide separated fault signal relay contacts for power supply fault and module fault signal.
Two D5001S modules can be paralleled for 1oo2 redundancy, to increase availability on fault detection.



Intrinsically Safe products

G.M. International has obtained IS certificates from the most credited Notified bodies in the world for its D1000 Series. D5000 and D5200 Series will be applied for certification in 2010.



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.



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. The D5000 and D5200 Series will be applied for soon.

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 9001/2008.

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: -40 to +60 / 70 °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 95 %, 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 contain 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.

Maintenance and Repair

Series D5000 and D5200 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.

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, 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**:
Peff ≤ Σ Pmax * 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, the calculation of the maximum allowed power dissipation in this type is:

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

where: **Pmax [W]** maximum allowed power dissipation
Δt [°C] maximum allowed temperature rise
S [m²] free heat emitting surface of the cabinet
K [W/m² * °C] 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, to circulate vertically around the equipment extracting heat and to exit at the top), the power dissipation improvement can be 50% better than case 1.

The cabinet must be equipped with inlet and outlet louvers in the lower and upper ends, 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, flows through the equipments, and finally exits at the top, where generally is forced by one or more fans. The calculation of the required airflow is:

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

where: **Q [m³/h]** is the required air flow
Peff [W] is the dissipated power (typical 70 % of the maximum power dissipation)
Δt [°C] 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 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.

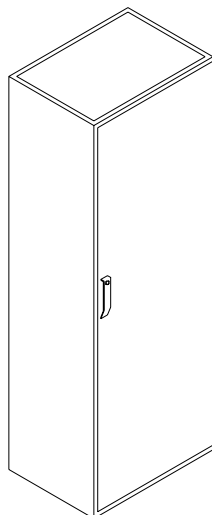
As an example a cabinet sized 600x600 mm and 2000 mm high has a temperature rise of 10 °C for an installed power of 1000 W.

5) Air Conditioned Cabinets

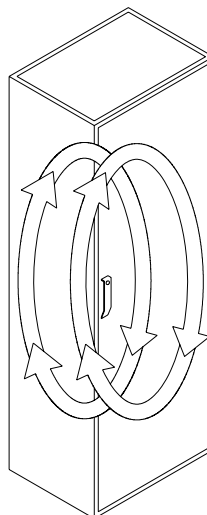
Air conditioned cabinets are preferred in hot climates and / or harsh environments. Cabinet temperature can become equal or even lower than the ambient temperature. A specific refrigerating system or the existing air conditioning system can be used for cabinet conditioning.

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.

Example 1
Natural convection
~ 250 - 300 W

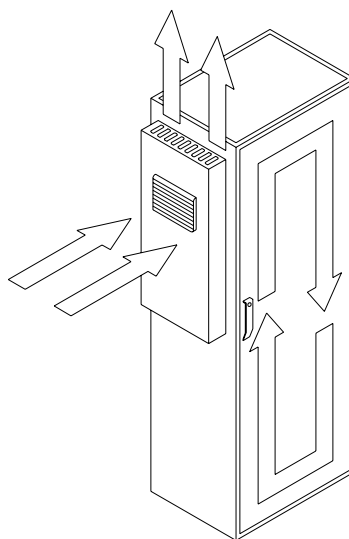
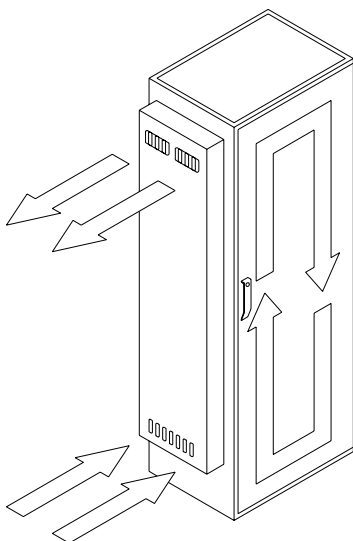


CLOSED VERSION



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

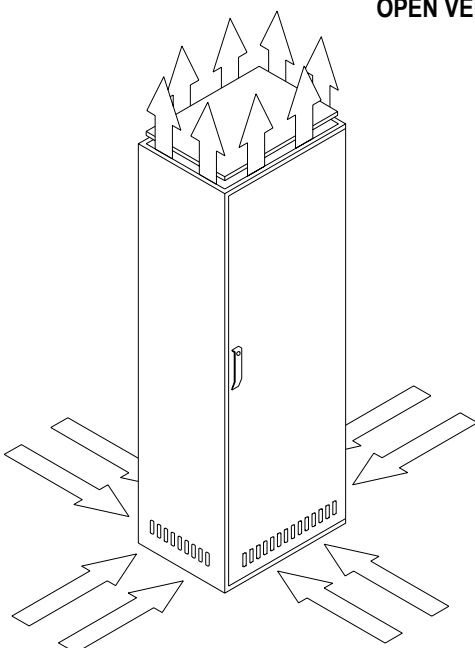
Example 4
Forced air circulation
via heat exchanger
(air circulation by two
separate flows internal
and external)
~ 1000 W



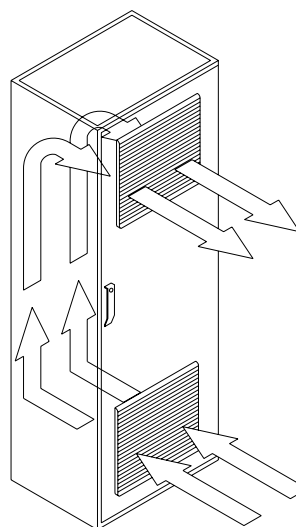
Example 5
Heat dissipation via air
conditioner (cooling by
temperature lower than
the ambient temperature)
~ 1000 W

Power value dissipated per $\Delta T = 10^{\circ}\text{C}$ (single cabinet)
For installation in a row of cabinets, power dissipated in the first two examples is decreased of about 15%

Example 2
Air flow
(Natural convection)
~ 350 - 450 W



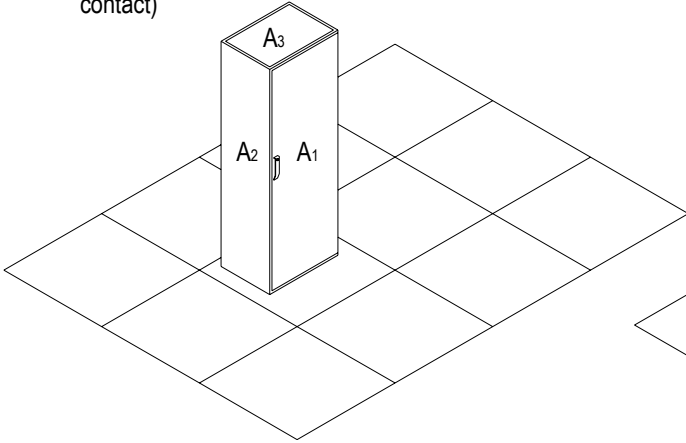
OPEN VERSION



Example 3
Air flow
(filtered fans)
~ 500 - 750 W

Power value dissipated per $\Delta T = 10^{\circ}\text{C}$ (single cabinet)
For installation in a row of cabinets, power dissipated in the above two examples is decreased of about 5-10%

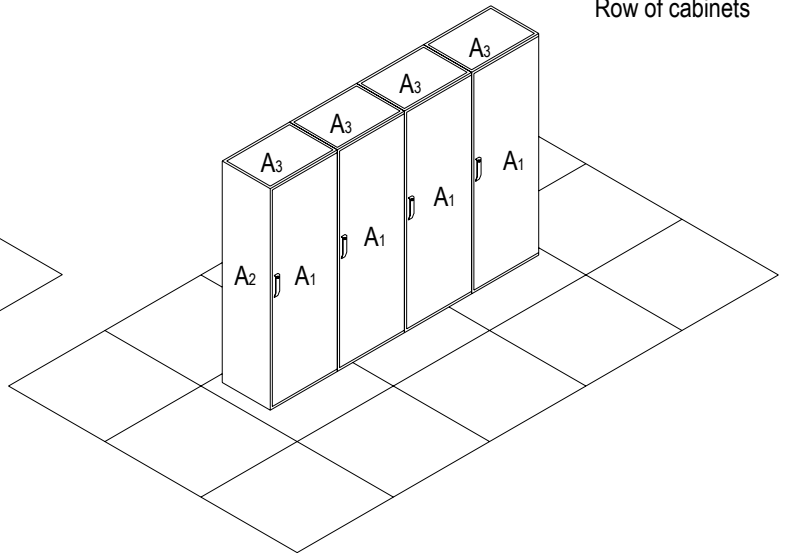
Single cabinet
(all surfaces free of contact)



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

Formula for cabinet with no surfaces in contact with the wall

Row of cabinets

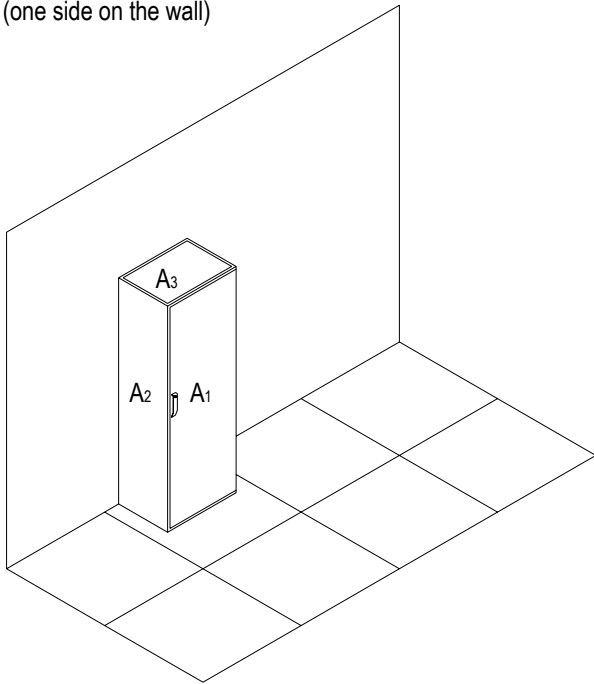


$$A_{TOT} = 2 \times N \times A_1 + 2 \times A_2 + N \times A_3$$

(N = Number of cabinets placed side by side)

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

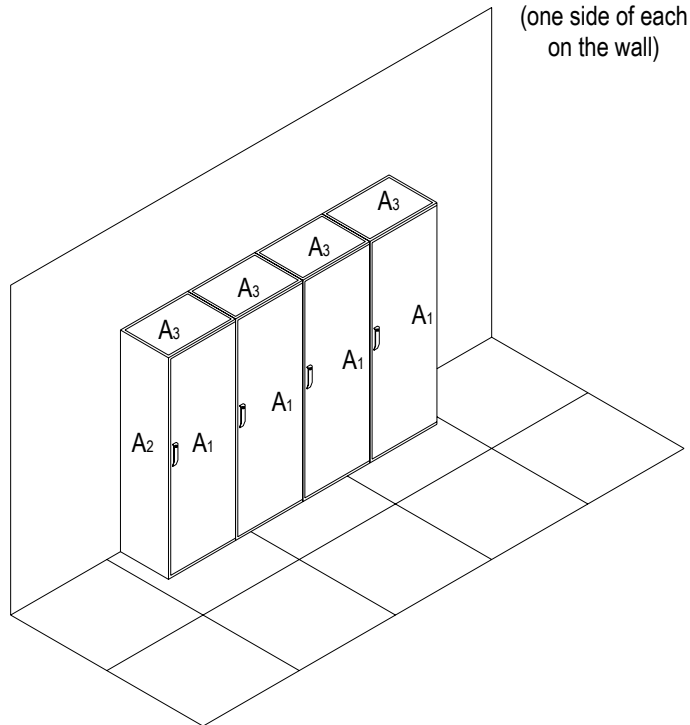
Single cabinet
(one side on the wall)



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

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)

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

(N = Number of cabinets placed side by side)

Formula for row of cabinets with one side on the wall

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 D5000 and D5200 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 D5000 and D5200 series and cable channels. We recommend a distance of 5 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.

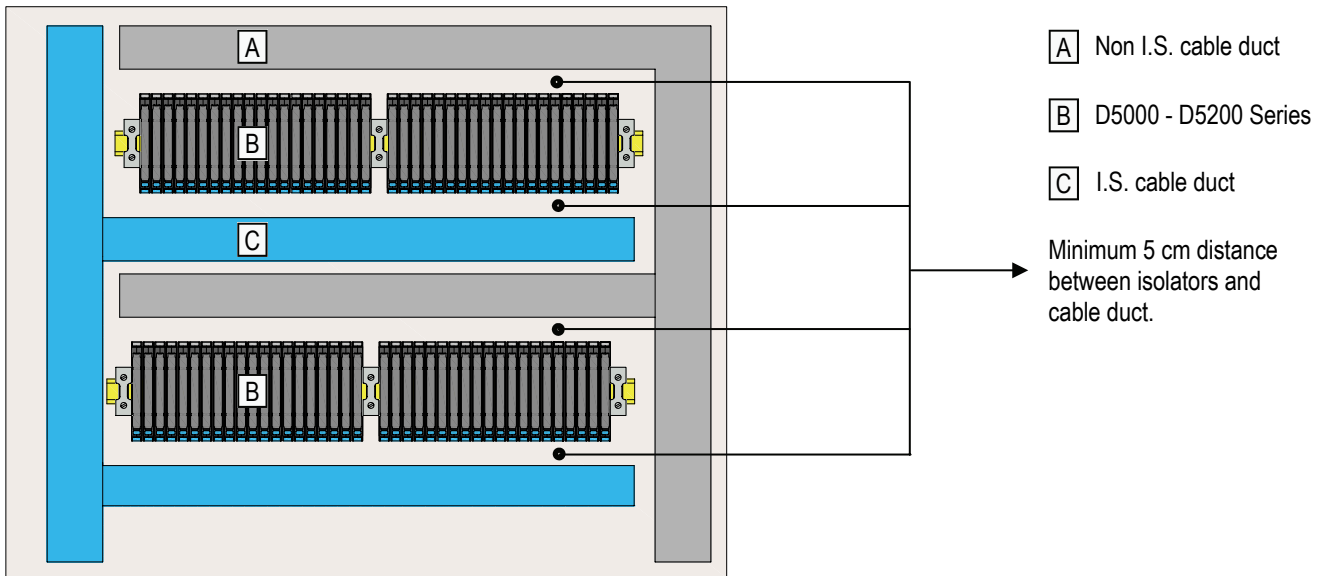


Fig. 1 Horizontal orientation in the cabinet

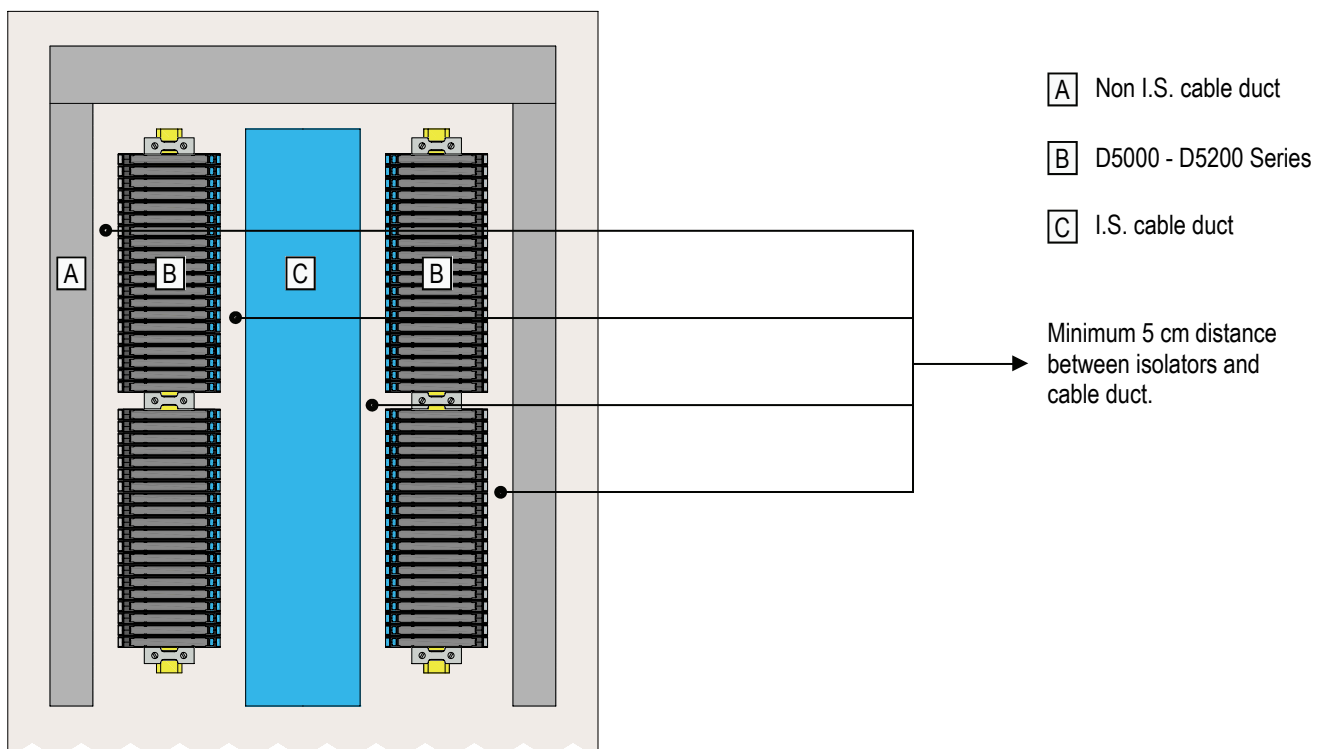


Fig. 2 Vertical orientation in the cabinet