INSTRUCTION MANUAL

D5000 - D5200 SERIES
DIN-RAIL, POWER BUS, TERMINATION BOARD MOUNTING
INTRINSICALLY SAFE ISOLATORS AND SAFETY RELAYS
Index

D5000 - D5200 Intrinsically Safe Isolators and Safety Relays

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### Mechanical features

**Mounting**

<table>
<thead>
<tr>
<th>Dimensions (D5000)</th>
<th>Dimensions (D5200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T35 DIN-Rail according to EN50022 with or without Power Bus connector or on Termination Board</td>
<td>Width 12.5 mm Depth 123.0 mm Height 120.0 mm Width 22.5 mm Depth 123.0 mm Height 120.0 mm</td>
</tr>
</tbody>
</table>

**Case material**

<table>
<thead>
<tr>
<th>Blister packing size (D5000)</th>
<th>Blister packing size (D5200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA66 - Polyamide (Nylon) 66</td>
<td>Width 24.0 mm Depth 132.0 mm Height 138.0 mm Width 34.0 mm Depth 132.0 mm Height 138.0 mm</td>
</tr>
</tbody>
</table>

**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 and removing modules from DIN-Rail

**Mounting**

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**

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).
Pull the module upwards and remove from DIN-Rail

Fig. 4

T35 DIN-Rail

Fig. 5

T35 DIN-Rail

Fig. 6

T35 DIN-Rail Dimensions (millimeters)
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.
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)**
DIN-Rail Stopper (MCHP196)

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

MOR022, MOR017: Plug-in terminal blocks

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

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

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

Mounting a plug-in terminal block female into a connector Power Bus
D5000 Series
Mounting a module onto 12 mm Power Bus connector and T35 DIN-Rail (JDFT049)

D5200 Series
Mounting a module onto 22 mm Power Bus connector and T35 DIN-Rail (JDFT050)

Ordering information

<table>
<thead>
<tr>
<th>Image</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>MCHP196</td>
<td>DIN-Rail Stopper</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>MOR017</td>
<td>Plug-in terminal block female, horizontal out, for Power Bus</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>MOR022</td>
<td>Plug-in terminal block male, horizontal out, for Power Bus</td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td>JDFT049</td>
<td>Connector 5 pin Power Bus 12mm DIN-Rail</td>
</tr>
<tr>
<td><img src="image5.png" alt="Image" /></td>
<td>JDFT050</td>
<td>Connector 5 pin Power Bus 22mm DIN-Rail</td>
</tr>
</tbody>
</table>
Removing and mounting Main Case Top Cover

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

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.
2. Pull firmly main case top cover as shown 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 complete closure. Operating parameters connector, LEDs for power, status and fault indication are visible through the transparent cover.
Screwdriver for Terminal Blocks
3.5 x 0.6 mm

Stripping length
7 mm

Main enclosure terminal block connection data

<table>
<thead>
<tr>
<th>Conductor cross section</th>
<th>From data</th>
</tr>
</thead>
<tbody>
<tr>
<td>solid</td>
<td>From 0.2 mm² to 2.5 mm²</td>
</tr>
<tr>
<td>stranded</td>
<td>From 0.2 mm² to 2.5 mm²</td>
</tr>
<tr>
<td>stranded, with ferrule without plastic sleeve</td>
<td>From 0.25 mm² to 2.5 mm²</td>
</tr>
<tr>
<td>stranded, with ferrule with plastic sleeve</td>
<td>From 0.25 mm² to 2.5 mm²</td>
</tr>
<tr>
<td>AWG</td>
<td>From 24 to 12 AWG</td>
</tr>
</tbody>
</table>

Power Bus terminal block connection data

<table>
<thead>
<tr>
<th>Conductor cross section</th>
<th>From data</th>
</tr>
</thead>
<tbody>
<tr>
<td>solid</td>
<td>From 0.14 mm² to 1.5 mm²</td>
</tr>
<tr>
<td>stranded</td>
<td>From 0.14 mm² to 1.5 mm²</td>
</tr>
<tr>
<td>stranded, with ferrule without plastic sleeve</td>
<td>From 0.25 mm² to 1.5 mm²</td>
</tr>
<tr>
<td>stranded, with ferrule with plastic sleeve</td>
<td>From 0.25 mm² to 0.5 mm²</td>
</tr>
<tr>
<td>AWG</td>
<td>From 28 to 16 AWG</td>
</tr>
</tbody>
</table>
Mounting a module onto a Termination Board

1. Push over the module to Termination Board. Aligning the module to the latching mechanism.

2. Press bottom up the Safe Area latch

3. Press bottom up the Hazardous Area latch

Latches position before pressure

Latches position after pressure

Safe Area connectors

Latching mechanism
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
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.

**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.

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[T35 DIN-Rail Diagram]

**Supply line 1**

**Supply line 2**

**Output connector**

**Hart Multiplexer connectors**

**Spare fuse**

**Common fault output signal**

**Supply paralleling diodes**

**Power ON LEDs 1 - 2**
Intrinsically Safe products

**G.M. International** has obtained IS certificates from the most credited Notified Bodies in the world for its D5000 Series.

**Approvals and Certifications**

**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.

**Maritime Type Approval**

**G.M. International** offers Type Approval Certificates for its line of Intrinsically Safe Isolators D5000 Series and Power Supplies for use in Maritime 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 9001/2008.

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 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.

**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 G.M. 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 G.M. 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 so by summing the power of each unit in the cabinet the total power dissipation can be reduced. The maximum power consumption of each type of isolator is specified, 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 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:

\[ \text{Peff} \leq \sum \text{Pmax} \times 70\% \]

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:

\[ \text{Pmax} = \Delta t \times S \times K \quad \text{and} \quad \Delta t = \frac{\text{Pmax}}{S \times K} \]

where:
- \( \text{Pmax} \) [W] maximum allowed power dissipation
- \( \Delta t [\degree C] \) maximum allowed temperature rise
- \( S [m^2] \) free heat emitting surface of the cabinet
- \( K [W/m^2 * \degree C] \) 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 high. 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:

\[ Q = 3.1 \times \frac{\text{Peff}}{\Delta t} \]

where:
- \( Q [m^3/h] \) is the required air flow
- \( \text{Peff} [W] \) is the dissipated power (typical 70 % of the maximum power dissipation)
- \( \Delta t [\degree C] \) 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.
Heat dissipation in cabinets

**Example 1**
Natural convection

~ 250 - 300 W

**Example 2**
Air flow (Natural convection)

~ 350 - 450 W

**Example 3**
Air flow (filtered fans)

~ 500 - 750 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 $\Delta T = 10^\circ$C (single cabinet)

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

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

Single cabinet (all surfaces free of contact)

\[ A_{\text{TOT}} = 2 \times A_1 + 2 \times A_2 + A_3 \]

Formula for cabinet with no surfaces in contact with the wall

Row of cabinets

\[ A_{\text{TOT}} = 2 \times N \times A_1 + 2 \times A_2 + N \times A_3 \]

(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)

\[ A_{\text{TOT}} = 1 \times A_1 + 2 \times A_2 + A_3 \]

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)

\[ A_{\text{TOT}} = N \times A_1 + 2 \times A_2 + N \times A_3 \]

(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.

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**Fig. 1** Horizontal orientation in the cabinet

**Fig. 2** Vertical orientation in the cabinet