GE Consumer & Industrial

Multilin

HID

High Impedance Differential Module

Instruction manual

GEK-113064

ISO9001 REGISTERED

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1. GETTING STARTED

1.1 IMPORTANT PROCEDURES

To help ensure years of trouble free operation, please read through the following chapter for information to help guide you through the initial installation procedures of your new device.

Before attempting to install or use the device, it is imperative that all warnings and cautions in this manual are reviewed to help prevent personal injury, equipment damage, and/or downtime.

1.1.1. CAUTIONS AND WARNINGS

CAUTION

The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

Installation must be according to the national electric code of the appropriate country.

FIGURE 1-1 FRONT VIEW OF HID UNITS

1.2 *INSPECTION CHECKLIST*

Open the device packaging and inspect the HID for physical damage.

Refer to the label on the side of the device and verify that the model number is the correct model ordered.

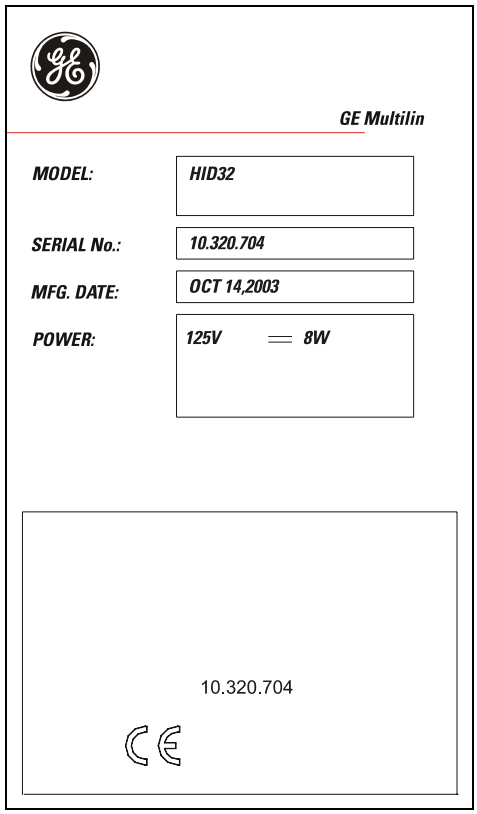

FIGURE 1-2 IDENTIFICATION LABEL (A4454F21)

Please ensure that you receive the following items with your device:

- Mounting screws for rear terminals and for fixing the device to a cabinet
- Wiring diagram
- Certificate of compliance

For product information, instruction manual updates, please visit the GE Multilin Home Page (www.GEMultilin.com).

Note: If there is any physical damage noticed on the device, or if any of the contents listed are missing, please contact GE Multilin immediately.

GE Multilin contact information:

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The information provided herein does not intend to cover all details of variations of the described equipment nor does it take into account the circumstances that may be present in your installation, operating or maintenance activities.

Should you wish to receive additional information, or for any particular problem that cannot be solved by referring to the information contained herein, please contact GE MULTILIN.

1.3 *SAFETY INSTRUCTIONS*

WARNING

In order to prevent personal damage connect the device to ground.
For this purpose, please follow the safety instructions below.

The ground screw shown in the following figure must be correctly grounded.

FIGURE 1-3 GROUNDING SCREW LOCATION

GE Multilin will not be responsible for any damage in the device or connected equipment whenever this elemental safety rule is not followed.

1.4 *HID OVERVIEW*

High Impedance Differential protection is a well-known principle where stabilizing resistors provide immunity against external faults. HID modules provide resistors together with voltage limiters (MOV) to be used with a high-speed overcurrent relay in order to obtain a high impedance differential protection scheme. External CT's are differentially connected exactly as for traditional high impedance differential protection relaying.

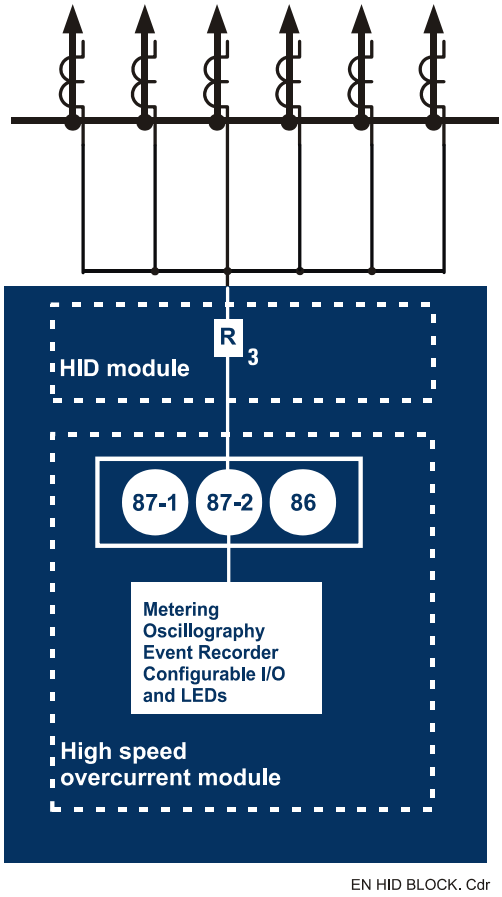


FIGURE 1-4 TYPICAL APPLICATION OF AN HID AS A BUSBAR DIFFERENTIAL PROTECTOR

1.4.1. MOUNTING & WIRING

Please refer to the HARDWARE chapter for detailed device mounting and wiring instructions. Review all **WARNINGS and CAUTIONS.**

1.4.2. FRONT PLATE BUTTON

The HID front plate incorporates a reset pushbutton to reset the latching relay once the fault has been cleared, in order to eliminate the resistors short-circuit.

FIGURE 1-5 HID FRONT PANEL

2. PRODUCT DESCRIPTION

2.1 INTRODUCTION

2.1.1. GENERAL OVERVIEW

HID modules provide resistors together with voltage limiters (MOV) to be used with high-speed overcurrent relay in order to get a high impedance differential protection scheme.

The overcurrent relay unit connected in series with the resistors provides high-speed operation for busbar faults involving high-magnitude currents. A voltage-limiting element is connected in parallel to avoid excessively high CT secondary voltages, which can damage current inputs when bus faults occurred. Since the overcurrent unit is relied on only for high magnitude currents, its pickup can easily be set high enough to avoid operation for external faults.

The procedure for determining the necessary settings and the resulting sensitivity to low-current bus faults is very simple and straightforward, requiring only knowledge of the CT secondary excitation characteristics and their secondary impedance.

For the best possible results, all CT's should have the same rating, and should be a type, like a bushing CT with a distributed secondary winding, that has little or no secondary leakage reactance.

A voltage-limiting element is connected in parallel, in order to prevent excessively high CT secondary voltages when bus faults occurred.

The HID includes voltage-limiting resistors. This feature makes the HID better suited to those applications where high internal fault currents can be encountered.

Typical applications include high impedance differential protection for busbars and electrical machines, such as transformers, generators or motors, as well as restricted earth fault protection. HID modules are available in single-phase models for applications such as restricted earth fault protection in a transformer winding, models with two resistors for applications in transformers with two grounded windings, and three-phase models for busbar high impedance differential protection.

Each HID module incorporates 2000-Ohm resistors that provide the associated high impedance relay with stability against external faults, and varistors (MOV – Metal Oxide Varistors) in order to limit the voltage peak in the secondary under 2 kV during fault conditions. Additionally, a latching relay is incorporated, whose contacts are aimed to short-circuit the resistors once the associated relay has tripped. This way, the fault current is prevented from circulating through the resistors.

The HID front plate incorporates a Reset pushbutton to reset the latching relay once the fault has been cleared, in order to eliminate the resistors short circuit.

The external overcurrent unit may also be used to supplement with the implementation of breaker failure protection, since it may include timers, auxiliary contacts, digital inputs and programmable logic.

The combination of HID module with a high-speed overcurrent relay can be applied for bus protection in most cases where CTs having negligible leakage reactance are used. This generally includes any kind of current transformers with a toroidal core if the windings (on the tap used) are completely distributed about the core.

Additional functionality provided by the additional overcurrent device includes: time stamped sequence of event recorder, waveform capture, data logger, and communication to remote control centers.

2.2 ORDERING CODE

The information required to completely specify the relay is provided in the following table:

HID	-	-	
			APPLICATION
	1		1 Winding Transformer REF – 1 resistor + 1 MOV
	2		2 Winding Transformer REF – 2 resistors + 2 MOV
	3		Busbar Application. High Impedance Differential Element
			LATCHING RELAY / POWER SUPPLY
		0	Without latching relay
		1	48 Vdc Latching relay
		2	125 Vdc Latching relay
		3	220 Vdc Latching relay

2.3 TECHNICAL SPECIFICATIONS.

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

2.3.1. VOLTAGE LIMITERS

TECNOLOGY: MOV (METAL OXYDE VARISTOR)

Rated Voltage (VDC):	350 V
Rated Voltage (VAC):	290 V
Rated Current (VDC):	4.7 mA ± 50%
Pick Voltage:	1,900 V
Pick Current:	10 A
Power Dissipation:	8 W
Rated Power Absorption:	5,400 J with latching relay
	10,000 J without latching relay

2.3.2. STABILIZING RESISTORS

Models with latching relay	2kΩ 75W
Models without latching relay	1kΩ 100W

2.3.3. LATCHING RELAY

RATED VOLTAGE

Latching relay option 1	48 VDC
Latching relay option 2	125 VDC
Latching relay option 3	220 VDC

OPERATION RANGES

Operation range	80 % to 150 % of rated voltage
Consumption	8 W at rated voltage
Pickup value	60% of rated voltage

OPERATING TIME (at rated voltage)

Close time (N.O. contact)	< 25 ms.
Open time (N.C. contact)	< 20 ms.

CONTACTS

Continuous current	10 A continuous
	20 A during 1 minute
	200 A during 1 second
Make and carry	30 A
Breaking	5000 VA non inductive at 250 Vac
	375 W inductive at 125 Vdc.
	250 W inductive at 250 Vdc.

ENVIRONMENTAL

Temperature range	-20ºC to +60ºC
Maximum relative humidity	95%

Dielectric Withstand

Between independent circuits	2500 Vca one minute
Between circuits and ground	2500 Vca one minute
Between open contact terminals	1800 Vca one minute
Mechanical life	More than 10 million operations

2.3.4. ENVIRONMENTAL

Operating Temperatures:	-20º C to +60º C
Ambient Storage Temperatures:	-40º C to +80º C
Maximum relative humidity	95%
Altitude	2000 m. Max
Pollution Degree	2

2.3.5. TYPE TESTS & CERTIFICATIONS

The **HID** system complies with the following standards, which include the standards required by Community Directive 89/336 for the CE marking, in line with European standards. It also complies with the European directive requirements for low voltage, and the environmental and operating requirements established in ANSI standards C37.90, IEC 255-5, IEC 255-6 and IEC 68.

Electrical Environment

Test	Standard	Class
IEC 60255-5	Insulation - Dielectric	2kV
IEC 60255-5	Insulation – Impulse Voltage	5 kV, 0.5 J.

Atmospheric Environment

Test	Standard
IEC 60068-2-1	Temperature Cold Heat
IEC 60068-2-2	Temperature Dry Heat
IEC 60068-2-3	Relative Humidity

2.3.6. APPROVALS

- Manufactured under an ISO9001 Registered system.
- CE Marking.

3. HARDWARE

WARNING

The HID system incorporates components that might be affected by electrostatic discharge currents flowing through certain component terminals. The main source of electrostatic discharges is human body, especially under low humidity conditions, with carpet floors or isolating shoes. If such conditions are present special care should be taken while manipulating HID modules. Operators, before even touching any components, must make sure that their bodies are not charged by either touching a grounded surface or by using an antistatic grounded wrist bracelet.

3.1 MODULE DESCRIPTION

The HID units incorporate the following parts:

1. Latching relay
2. Resistors
3. MOV (Metal Oxide Varistor)
4. Reset button

- Metallic Case

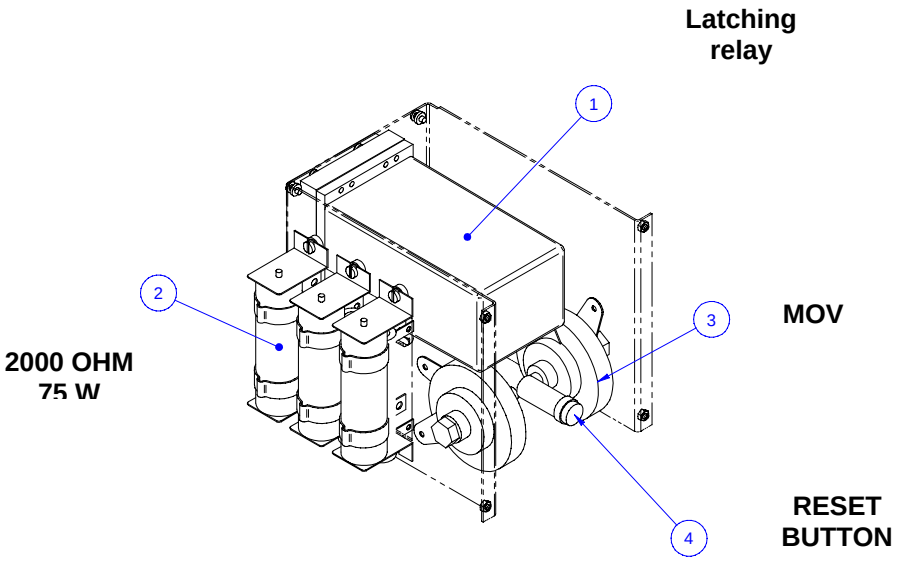


FIGURE 3-1 INTERNAL MOUNTING VIEW

3.1.1. MOUNTING

The HID module is composed of a black metallic stainless steel case. The case contains a metallic panel to which the MOV (Metal Oxide Varistors) and the stabilizing resistors are hooked, as well as the connections base for the latching relay and internal connections among the stabilizing resistors, MOV, and latching relay contacts.

Components are mounted on a base screwed to the rear side of the case. The module is closed with the frontal plate where the latching relay reset button is located.

The wiring is made in the rear side of the module.

Drilling dimensions are shown on the drilling dimension diagram (FIGURE 3-5)

3.1.2. EXTERNAL CONNECTIONS DIAGRAM

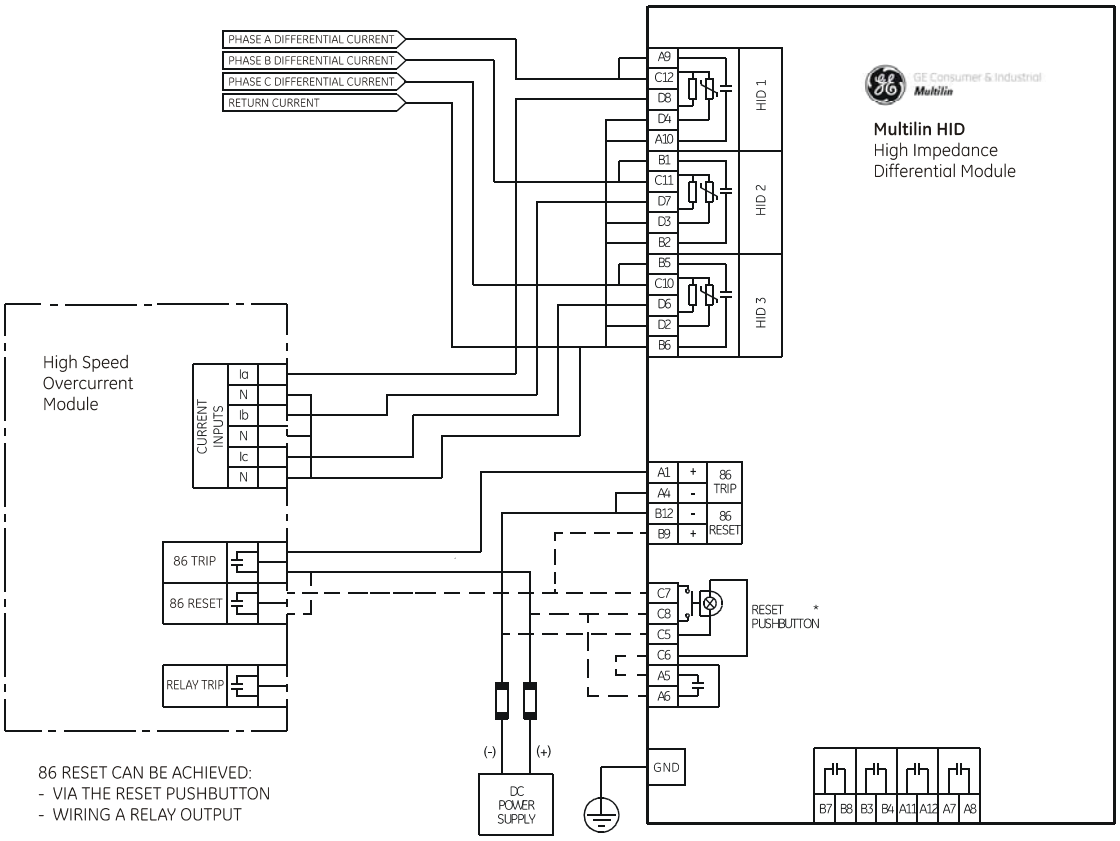


FIGURE 3-2 HID 32 WIRING DIAGRAM (226B5177)

3.1.3. CONTROL POWER

CAUTION

Control power supplied to the relay must match the rated voltage of the device. If the voltage is applied to the wrong terminals, damage may occur.

TABLE 3-1: CONTROL POWER VOLTAGE RANGE

Option	RATED VOLTAGE	OPERATION RANGE
0	48 Vdc	38.4~57.6 Vdc
1	125 Vdc	100- 150 Vdc
2	220 Vdc	176 – 264 Vdc

3.1.4. MECHANICAL DESCRIPTION

The HID module is available in a case of ½ rack four units high. The metallic case of the unit is highly resistant to corrosion. It is made of stainless steel (AISI 304), coated with an epoxy layer, and the rest of the metallic pieces are covered with a high quality resistive coating that has successfully passed at least 96 hours in the salt spray chamber (S/N ASTM B-117).

As well, an IP52 (IEC 529) protection degree against dust and water through the front and with the relay mounted in the panel.

3.1.5. MOUNTING

The HID module is secured to the panel with the 4 M6 screws provided with the unit. This allows the user access to the front reset button. The wiring is at the rear of the unit. The drilling dimensions are shown on the drilling dimension diagram.

3.1.6. REAR DESCRIPTION

The module is wired through the terminal blocks located at the rear of the unit. The maximum recommended cable section for this terminal board, with the appropriate terminal, is 6 mm2 (AWG 10).

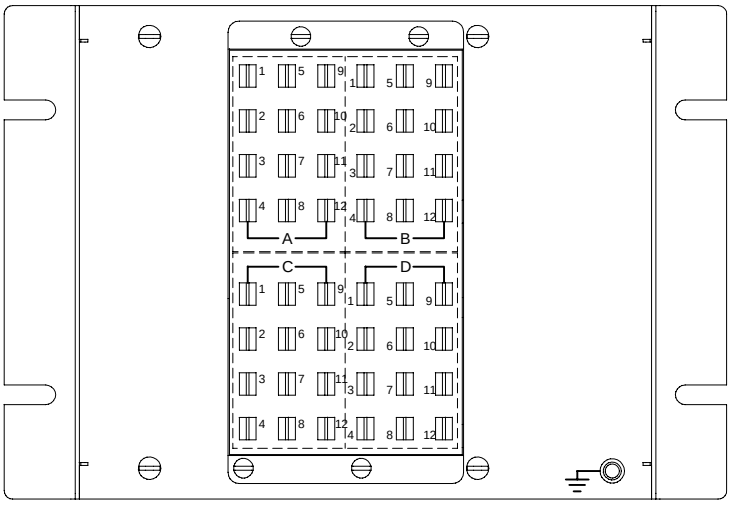


FIGURE 3-3 REAR TERMINALS DIAGRAM

3.1.7. INPUTS

HID inputs are composed of three elements:

- Stabilizing resistor
- MOV
- Contact from latching relay

Inputs vary depending on the HID model chosen. Thus, if the model corresponds to a type 1 application in the model selection list, HID will have one single input; two for a type 2 application and three for a type 3 application.

HIDs can be supplied with or without latching relay.

If the unit includes a latching relay, then MOVs and resistors are dimensioned according to the HLB tripping time, whereas if the unit does not include a latching relay, resistor and varistors are able to support a tripping time of 250ms.

HIDs with latching relay use 2 K 75W resistors, while HIDs without latching relay use 1 K 100 W resistors.

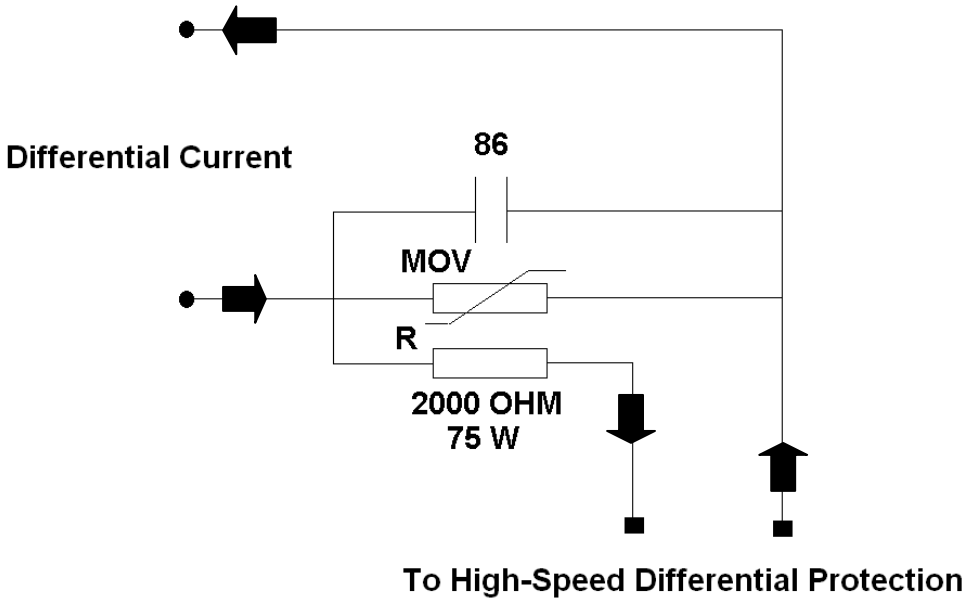


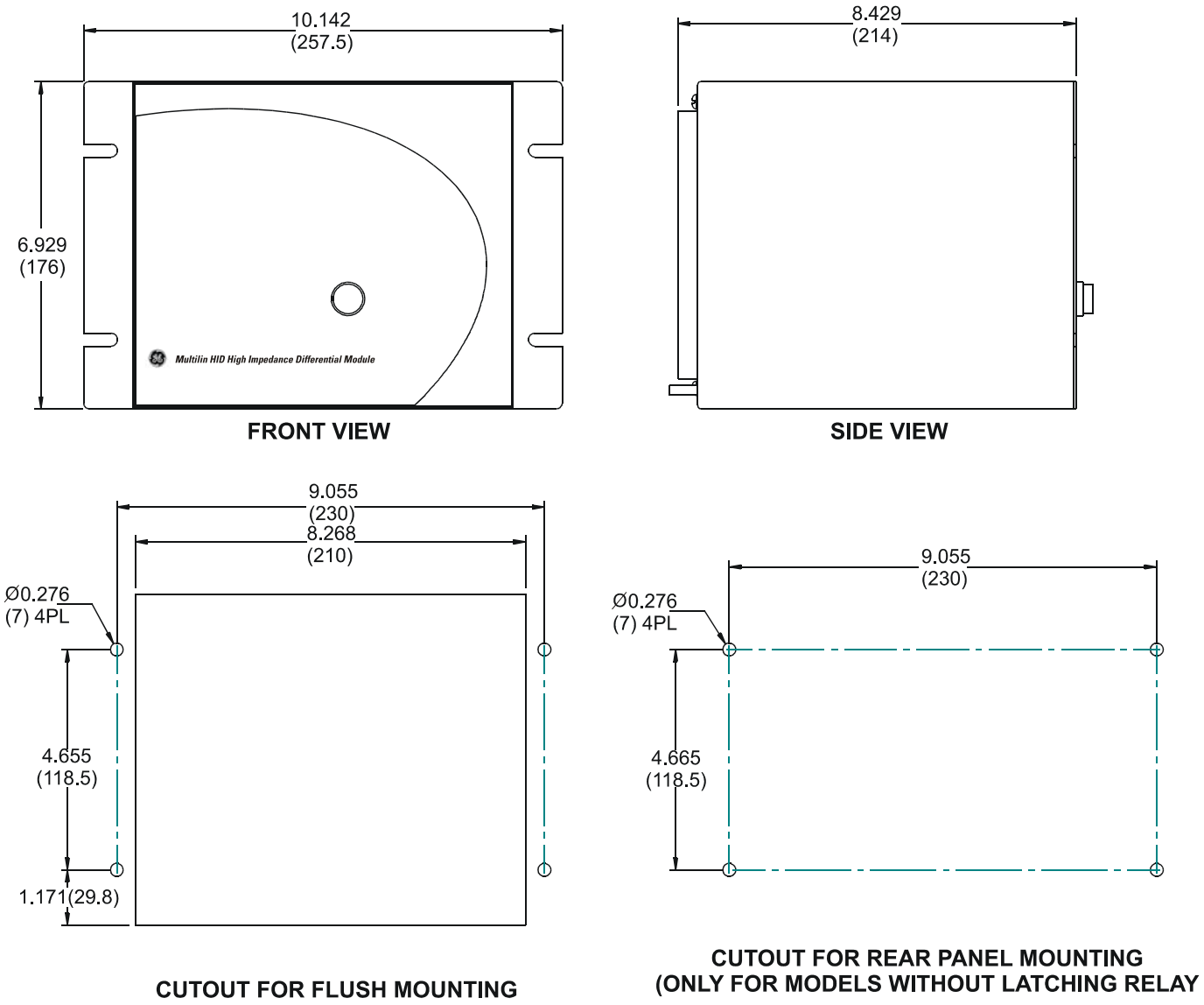
FIGURE 3-4 INPUT CONNECTIONS

Current flows through stabilizing resistors into current input of the overcurrent module. Once high-speed overcurrent module trips, latching relay contacts short-circuit stabilizing resistor plus current input. In this way, excessive heating causing damage to resistors is avoided. MOV is used to avoid over voltages damaging current input, limiting voltage to 1900V.

WARNING

In order to prevent personal damage connect the relay to ground.
For this purpose, please follow the safety instructions below

This module can be mounted together with a high-speed overcurrent module or it can be mounted alone. FIGURE 3-5 shows the drilling panel for this situation.



Dimensions shown in inches (mm)

FIGURE 3-5 DIMENSIONS AND DRILLING FOR HID MODULE

4. ACCEPTANCE TESTS

Acceptance tests include tests for both HID module and the latching relay 86.

For the latching relay, this manual proposes to test the open and close coils operation, and the correct contact activation.

4.1 WIRING AND NECESSARY EQUIPMENT

Necessary equipment:

1 AC voltage source.

1 DC voltage power supply.

1 timer.

1 Multi-meter.

External wiring diagram: B5180F*

NOTE: Groups described in the tests correspond to an HID model with three inputs. For other models, please check the corresponding external wiring diagram.

4.2 VISUAL INSPECTION

- Verify that the HID unit has not suffered any damage due to its handling and transport.
- Verify that all the screws are correctly fixed and that the terminal board is in good condition.
- Check that the information shown on the relay identification label corresponds to the requested relay model.

4.3 CONTINUITY

Test equipment:

An Multimeter or continuity measurer with a maximum threshold of 110 Ω.

Method:

Check for continuity between the grounded screw and any metallic point of the case that has no painting on it.

4.4 ISOLATION TEST

IMPORTANT:

During all tests, the screw located on the rear of the relay must be grounded.

For verifying isolation, independent groups will be created, and voltage will be applied as follows:

2500 RMS volts will be applied **progressively** among all terminals in a group, short-circuited between them and the case, during one second. In case the Hi-Pot device used to test the relay trips due to excessive consumption, apply the test between each group and ground one at a time.

2500 RMS volts will be applied **progressively** between groups, during one second.

- Group 1 (LATCHING RELAY contacts): A5 – A6 – A7 – A8– A9 – A10 – A11 – A12– B1 – B2– B3 – B4– B5 – B6 – B7 – B8
- Group 2 (LATCHING RELAY coils): A1 – A4 – B9 – B12
- Group 3 (Pushbutton): C5 – C6 – C7 – C8
- Group 4 (Analog Group): C10 – C11 – C12 – D6 – D7 – D8 – D2 – D3 – D4

Consumption will not be higher than 20 mA.

4.5 *MEASURES*

Latching relay coil resistor (only for latching relay option) :

Latching relay option	Terminals A1 – A3	Terminals B10 – B12
1 (48 Vdc)	340 Ohm	340 Ohm
2 (125 Vdc)	2K15	2K15
3 (220 Vdc)	4K2	4K2

NOTE: An error of 20% will be admitted

Resistors Measure:

Check that the resistor value between terminals is:

- 2K with latching relay
- 1K without latching relay

NOTE: An error of 12% will be admitted

- C12 – D8
- C11 – D7
- C10 – D6

Thyrites current measure:

Thyrite Terminals	Applied voltage
	290 Vac
C12 – D4	2 - 10 mA
C11 – D3	2 – 10 mA
C10 – D2	2 - 10 mA

4.6 *LATCHING RELAY VERIFICATION*

Contact test:

- Check with the external wiring diagram that all the auxiliary contacts of the latching relay are open and, therefore, there is no continuity between them.

Apply voltage to terminals +A1 y –A4 and verify that latching relay contacts operation time is below 25 ms.

- Verify that all auxiliary contacts have changed their position to closed and that there is continuity between each pair of them.
- Apply voltage to terminals +B9 and –B12 and verify that latching relay contacts opening time is below 20 ms.
- Check that all auxiliary contacts have changed to their default position (open) and, therefore, there is no continuity between each pair of them.

Lamp:

- Apply the latching relay rated voltage to terminals CN-A6 and CN-A9 and check that the button lightens up.
- Switch the voltage off and check the lamp turns off.
- Press the button and check for continuity between CN-A7 and CN-A8