

SHORT FORM CATALOG

INTRINSICALLY SAFE, SIL CERTIFIED INSTRUMENTATION FOR HAZARDOUS AREAS

GM INTERNATIONAL
TECHNOLOGY FOR SAFETY

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SIL Poster

Understanding Safety Integrity Levels

Quick reference table on the major concepts of IEC 61508 and IEC61511 standards.
Risk reduction, ALARP, Availability and Reliability formulae, SIL levels table, frequent acronyms, PFDavg simplified calculations formulae, system architectures, Safety Failure Fraction table and more.
A2 size (40x60cm) posters. Order your free copy or downloaded it from our website.



I.S. Poster

Understanding Hazardous Locations

Quick reference table on the major concepts of Intrinsic Safety for both Europeans and North American standards. Marking, temperature codes, hazardous area classification, gas groups, enclosure ratings, reference standards and more. A2 size (40x60cm) posters.



SIL Manual

Safety Instrumented Systems

The majority of our products are either SIL 3 or SIL 2 certified.
In years of designing safety and SIL rated electronics we have developed an understanding of SIL that combined with field experience gives us a unique knowledge of the subject.
Encouraged by our customers, we have translated such knowledge in a comprehensive manual, now at its third edition. It has been a great success story proving to be of great benefit for engineers, maintenance personnel and whoever wishes to approach the concept of functional safety.
The manual is available in English, Spanish and Italian language. Order your free copy.

COMPANY PROFILE

GLISENTE LANDRINI



is the President and Managing Director of G.M. International and of its worldwide subsidiaries.

The company was founded in 1993, but the core Management experience remarkably exceeds over 30 years of qualified activity in Intrinsic Safety and industrial electronics.
In 1970 Mr. Landrini founded Elcon Instruments, which has been acknowledged as an international leader in the design and manufacturing of Intrinsic Safety interface products and systems.

Mr. Landrini started G.M. International to provide state of the art SIL rated products and services to support Intrinsically Safe applications in Oil & Gas, Petrochemicals and Pharmaceutical Industries.

G.M. International's products have been successfully installed in plants all over the world, including Europe, Russia, North America, Middle and Far East and China.

MANAGEMENT TEAM

G.M. International's success is also due to it's experienced managers that have worked together for almost 20 years as a cohered team with safety as its common goal.



Massimo Landrini
Chief Financial Officer



Mauro Faltracco
Production Manager



Basilio Abbamonte
Quality Assurance Manager



Paolo Landrini
Export Sales Manager



Claudio Poncia
National Sales Manager



Giorgio Landrini
America Sales Manager

MANUFACTURING



LASER MARKING

All marking are made using a “State of the Art” laser etching machine; permanent in every environmental conditions. Marking include complete wiring diagrams, terminal block number assignments and certification data.



PRODUCT TRACEABILITY

All our products follow a strict traceability standard. From the batch of components through customer assignment and every manufacturing and testing step, data of individual modules are stored on our servers.

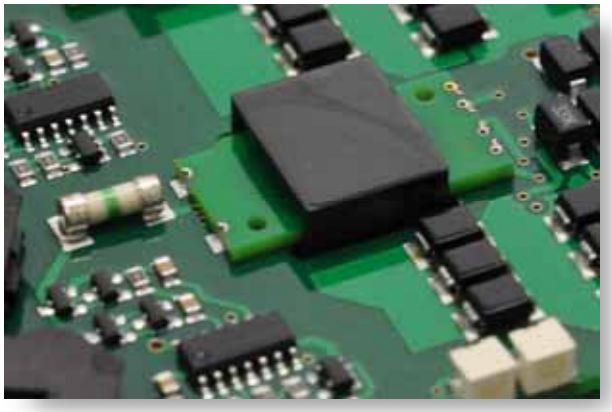
Starting from the serial number, the history of the module can be traced back to the batch of components used to manufacture it.



PROTECTIVE G3 COATING

The entire production is coated with a “G3” compliant silicon base coat.

“G3” Tropicalization is applied to improve electrical characteristics of the units as well as to protect from harsh environmental conditions.



INNOVATIVE DESIGN

D5000 series modules use embedded Planar Transformers to guarantee the highest reliability, the best accuracy and stability as well as low manufacturing costs.
We strive to use the best industry components, qualified as a minimum for operations up to 85°C, and use advanced designed techniques to improve performances and price.
For example, our D5000 series do not use electrolytic capacitors and have obtained TÜV certification for 20 years life time.

EXCELLENCE

HIGH RELIABILITY

Production is “burned-in” in an environmental chamber for 100 hours with temperatures cycling between the lowest and highest working temperature specified for the module, thus eliminating any “infantile mortality” problem.

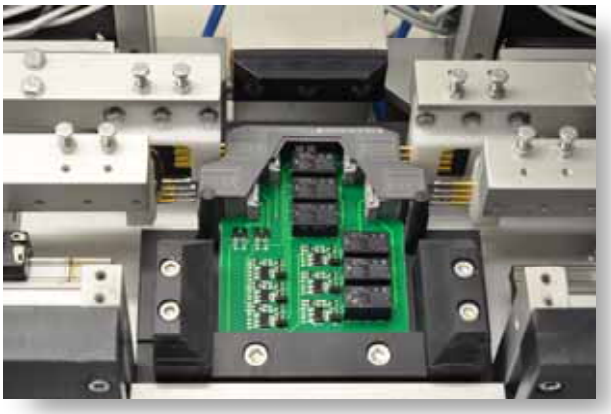


100 % TESTING

The entire production goes through rigorous and automated test and calibration procedures.

Test bench calibration is verified several times during the day to guarantee correct and repeatable results.

Our actual, verified according to ISO 9000:2008 records, field return rate is better than 0,1%.



CUTTING EDGE TECHNOLOGY

Automated assembly lines using the latest technology allow us to improve quality, delivery time and to lower manufacturing costs.

Investments are made in the production line to keep abreast with the latest technology.



MADE IN ITALY

Our products are proudly assembled, calibrated and tested in our own facilities in Villasanta, near Milan – ITALY.

We welcome visits from our customers from around the world.



QUALITY



RESEARCH AND DEVELOPMENT

G.M. International gives strategic importance to R&D activities and strives to have products conforming to the latest standards.



Research, development and manufacturing are strengthened through large investments.
Over 20% of the company employees are devoted to research, development and engineering of our products.

R&D personnel work closely with other company teams and keep close relationships with customers worldwide, combined with our many years of experience in all fields of applications are key factors to deliver products that meets customers requirement and anticipate market trends.
Ongoing trainings are also relevant in enhancing the company's efficiency and performance.



QUALITY

Quality is very important to achieve customer satisfaction and market success.

G.M. International's products satisfy customers' expectations and meet the specifications of international standards. Safety, performance, reliability and product documentation are the basic principles of product Quality.



HSE

G.M. International also strives to conform to latest HSE standards and conform to all our local Health and Safety regulations and requirements with continuous and extensive personnel formation and hands-on training.
Management is committed to the highest achievable HSE level throughout all stages of our activities and, it is our policy to protect our employees, clients, subcontractors and the community. Our objective is to reduce risks to the lowest levels in order to achieve a HSE goal of zero incidents.

EXCELLENCE

MANUFACTURING FACILITIES

G.M. International's products are manufactured entirely in our facilities in Villasanta (Milan) - Italy utilizing the latest technologies and machinery.



Having complete control on the manufacturing process ensures the highest level of quality and guarantees the most flexibility for all customers' requirements with improved delivery time for big or small orders alike.

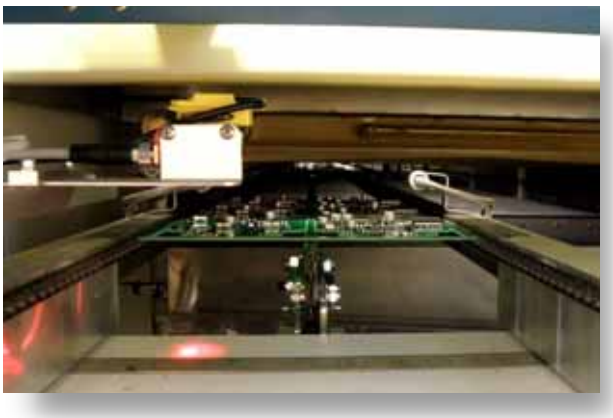
Manufacturing equipments are constantly renewed and updated; Automatic Test Equipment, specifically developed by our engineering team, are constantly checked and calibrated against traceable standards to ensure accuracy and repeatability.



ASSEMBLY TECHNOLOGY

We utilize latest assembly technology such as SMD mounting of most components including Terminal blocks and Transformers.

Soldering is performed using reflow technology; industry highest standard. Automatic optical verification of 100% of the assembled plates is performed at the end of the assembly process to weed out at the earliest stage all assembly and soldering flaws.



PERSONNEL

Qualified, experienced and continuously trained personnel is used to supervise machinery and to complete all manual assembly and test operations.



COMPANY GOAL AND VALUES

Our **goals** are:



- To design and manufacturer Intrinsically Safe Instruments suitable to operate at Safety Integrity Level 3 (SIL 3) with Digital Control, Emergency Shutdowns and Fire & Gas Systems,
- To understand, manage and reduce risk,
- To prevent accidents,
- To minimize impact on environment and climate,
- To create a safe and healthy working environment,
- To improve HSE results,
- To succeed over time in a competitive environment,
- To achieve 100% customer satisfaction.

For the achievement of such goals our **values** are:

- To identify opportunities and challenges,
- To be imaginative and stimulate new ideas,
- To be truthful and act with integrity,
- To work together and share experience,
- To strive for simplification and clarity, and focus on value-adding activities,
- To demonstrate social responsibility and contribute to sustainable development,
- To help others to succeed and contribute to a positive working environment.

CONTINUOUS EDUCATION

Continuous training and improvement of our staff's skills and capacities are key points to enhance company performances and customer's satisfaction.

G.M. International offers extra courses to raise our employees awareness of the company products and their use, in addition to mandatory training on HSE, Quality and manufacturing/testing practices.



CUSTOMER TRAINING

Special courses for engineering companies, end users and system integrators are also given both in-house and at customers sites on EX and SIL relevant standards.

Specifically, our SIL courses based on our SIL manual, have proven very informative and have gained strong popularity.



CUSTOMER SERVICE

G.M. International considers service as an integral part of customer's requirements and satisfaction.
Among the services we offer are:

- Cabinets' assembly according to customer's specification and world-wide EX standards;
- System Engineering;
- Custom solutions tailored to customer's special requests;
- ISO 9000:2008 certified post sales assistance service.

In our facilities we can also perform Factory Acceptance Tests (FAT) on products we have sold or on assembled cabinet projects. We can stage FATs in our facilities in Villasanta (MB) – Italy or we can support system integrators at their own facilities.





CUSTOMER SUPPORT

G.M. International considers customer support and after sales assistance as an integral part of the sales process.

Continuous support is given in all sales stages; from customers assistance in product selection, all the way to post sales support.

We have a devoted and experienced team of individuals ready to assist you.









ISOLATORS, RELAYS

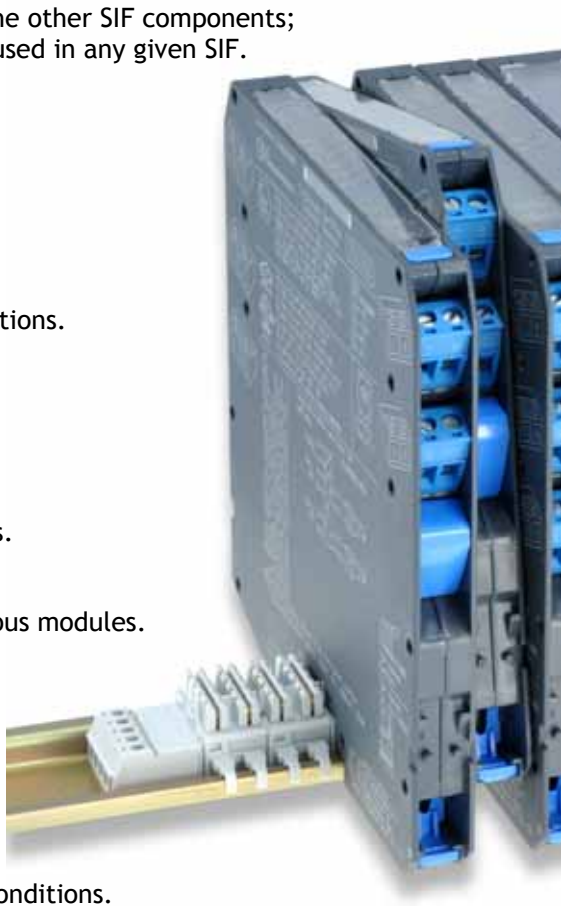
PRODUCT

- **SIL 3 according to IEC 61508 / 61511.**
  SIL 3 loop in 1oo1 configuration and total compliance with specifications for ESD, F&G, BMS.

- **TÜV certification**
  TÜV guarantees that product specifications, manufacturing facilities and final products conform to the obtained certificate through un-announced inspections.

- **5-10-20 years T-proof test time intervals.**
  Lower testing requirements after installation resulting in vast cost savings.

- **SIL Level claimed using only 10% of available PFD.**
  With a 10% limit on the claimed PDF, more room is made available for the other SIF components; of great help when components that are more prone to failure must be used in any given SIF.



- **Input from Zone 0, Division 1 for all products.**
  Universal application without having to worry about area classification.

- **Zone 2, Division 2 installation for all models.**
  Field installation is possible without further certifications.

- **Marine Type Approval for offshore and ship applications.**
  Broader application range with better reliability under all working conditions.

- **BUS option installation using standard Din Rail.**
  Use of same “low profile” rail for Bus or non Bus applications simplifies installation design.

- **Universal installation options**
  Standard Din Rail, Bus and Board Mounting available on all D5000 models.

- **Plug-in, hot-swappable modules**
  Bus mounted units can be replaced without disrupting power to contiguous modules.

- **High Density, as low as 6mm per channel**
  Footprint reduction results in lower costs and cleaner installations.

- **20 Years Life Time Certification.**
  Approved and tested for 20 years of continuous operation.

- **Line monitoring capabilities**
  Available in AI, AO, DI and DO modules both for open and short circuit conditions.
  Line monitoring alarm is signalled via: dry contact, impedance change and/or RS-485.

- **SIL 3 relay with Line monitoring**
  Relay modules are capable of detecting: load and wire open and short circuit condition; loss of power to the load; wiring ground leakage for any type of AC/DC load.

- **Transparent line monitoring**
  Most modules can reflect load conditions transparently to the PLC/DCS/ESD card without the need for additional channels and wiring.

- **Automated tests on 100% of production**
  All products are fully tested in all conditions; test data are stored and linked to each serial number for full traceability.

ADVANTAGES

- **Completely independent Dual Channel units**
  Each channel is powered through a dedicated and independent power supply preserving single channel integrity with reduced costs and space. Both channels are SIL certified and can be used without any concern regarding common failures in redundant applications such as 1oo2 or 2oo3.

- **250 Vrms (Um) maximum voltage allowed for associated instruments**
  Suitable in any application without the need to use special power supplies.

- **Permanent Laser Marking**
  Modules casing are permanently marked using laser beams with detailed information, such as wiring diagrams and terminal blocks numbers, ready for standard or harsh ambient conditions.

- **Isolation test**
  Not only transformers but complete units are tested for isolation from terminal to terminal.



- **Standard G3 Conformal Coating**
  Improved performances and protection in all environmental conditions.

- **Highest Temperature Rating; -40 / + 70°C**
  Widest applications range and increased reliability in extreme temperature conditions allowing compliance to a wider range of applications.

POWER SUPPLY SERIES

- **SIL 2 and SIL 3 according to IEC 61508 / 61511**
  SIL 2 loop in stand alone configuration or SIL 3 in N+1 configuration.

- **Automatic Load Sharing**
  Parallel configuration achieved without the need for an additional diode module.

- **Over voltage Protection**
  Three independent over voltage protections built-in to guarantee availability in all high or low failure modes.

- **Alarm Functions**
  Independent and remote alarm function for all potential failure conditions.

- **Regulated and Adjustable Output**
  Stable and adjustable 24 Vdc output to suit standard and special applications.

- **Low Power Consumption**
  Automatic power factor correction and high efficiency to guarantee low power consumption.

- **Fuse breaking capability / Short Circuit Proof**
  When output is shorted milliseconds burst of high current guarantee opening of any down-stream circuitry; even when improperly sized fuses are used. DC output is Short Circuit Proof.

- **Zone 2 / Division 2 installation**
  Most Power Supply Units are certified Ex-n for direct installation in classified area (Zone/Division 2).

- **Isolation**
  Full input, output and fault isolation.

APPROVALS AND CERTIFICATIONS

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.
All certificates 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 highest levels of safety through the entire instrumented system lifecycle.

The majority of our products are SIL certified; reports and analyses from TÜV 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 and Power Supplies for use in Marine and Offshore applications.

Certificates have been released by Det Norske Veritas in accordance to the following world standards: ABB, BV, DNV, GL, LR, NK, RINA; and by Korean Register of Shipping .

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.

All certificates can be easily downloaded from www.gmintsrl.com

WORLDWIDE PRESENCE

GM International products

are available trough a comprehensive network of Subsidiaries and Agents.
Visit our web site to find an expert near you.



INTERNET



www.gmintsrl.com

G.M. International offers a wide range of services and information online.

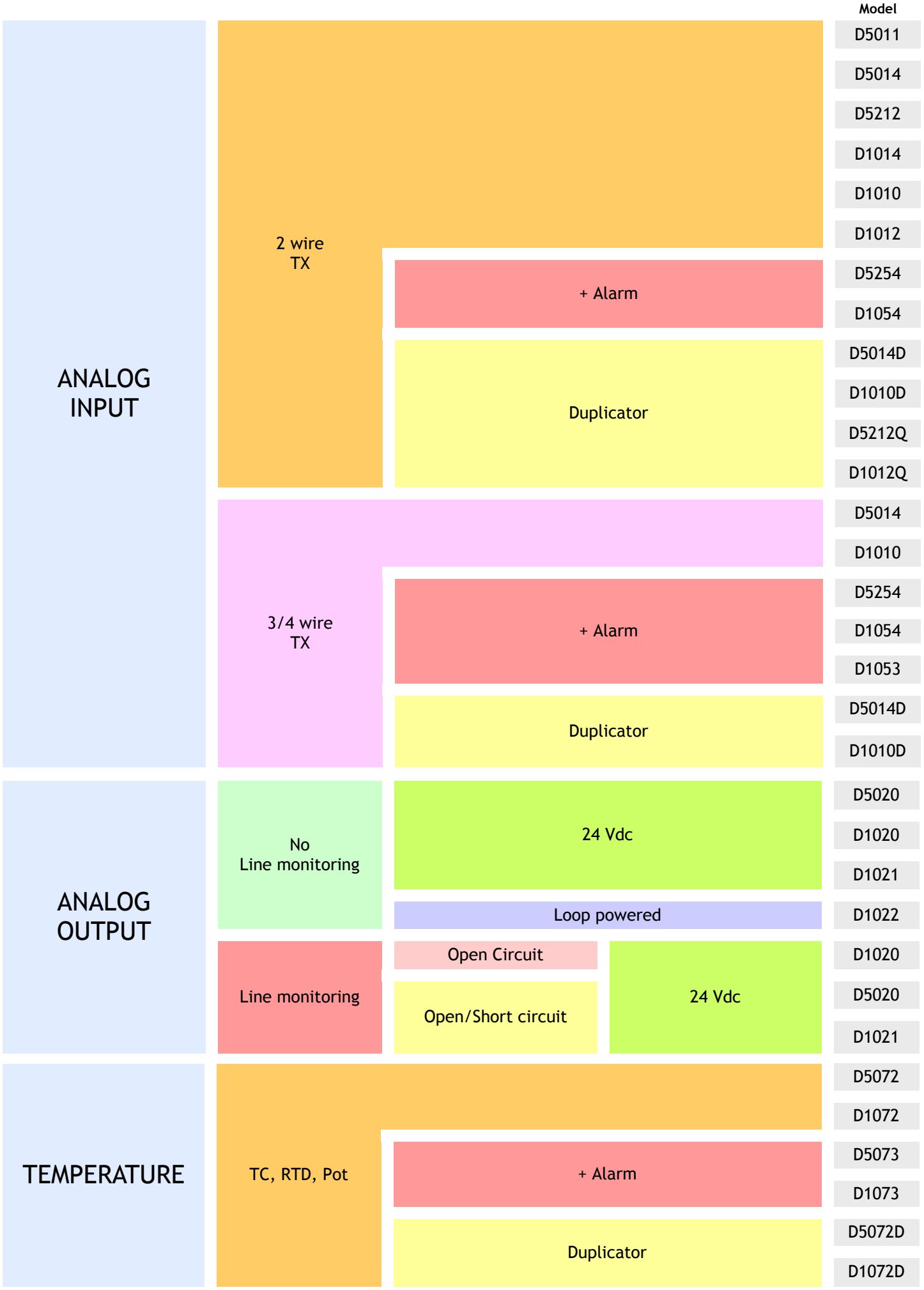
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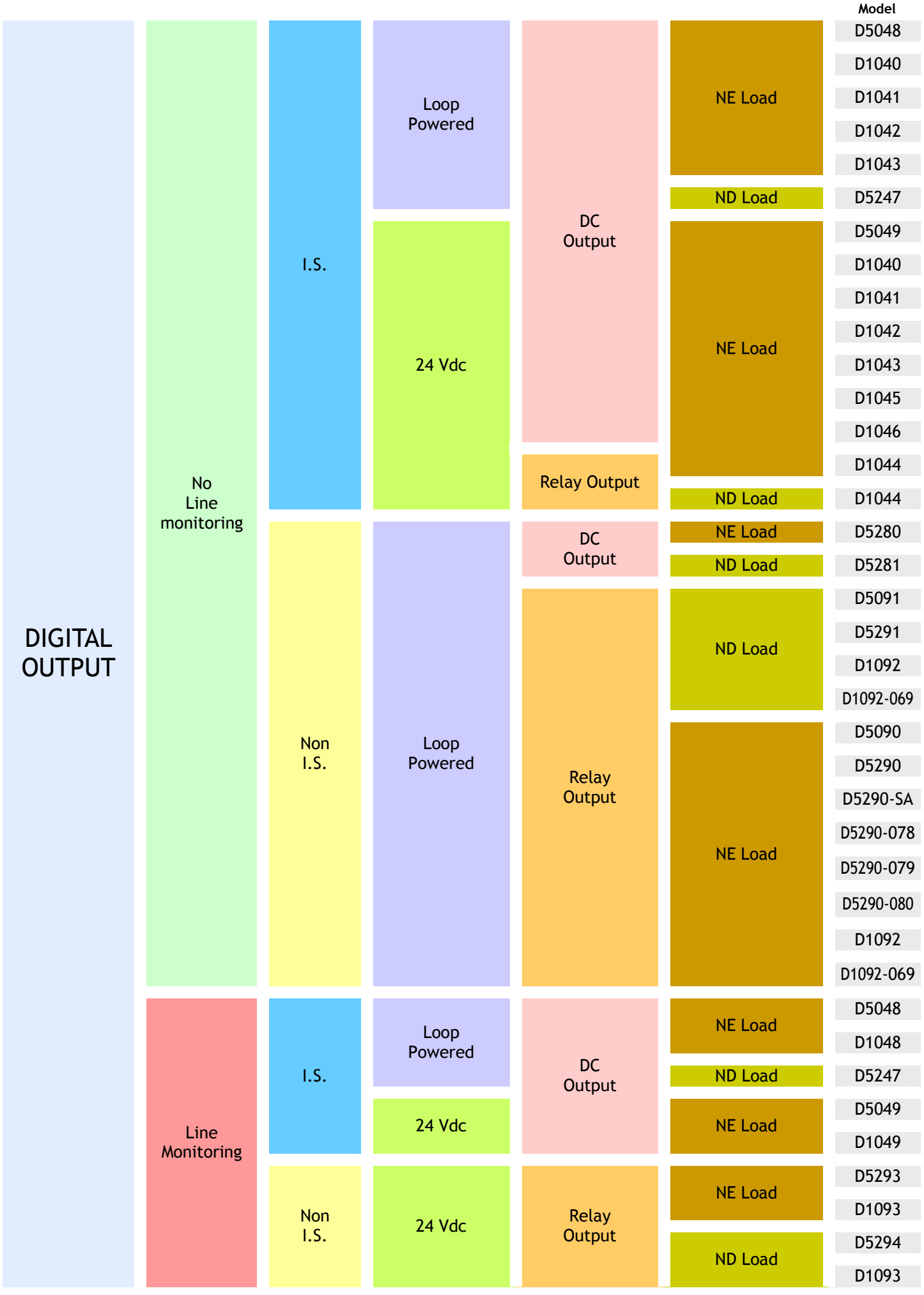
Contacts
- Agents and Distributors
- Technical and Commercial contacts
- Quotation request form

Utilities
- Online tools for webmasters
- Mailing List
- EX Loop verification tool


Model
ANALOG INPUT
2 wire TX
+ Alarm
Duplicator
D5011
D5014
D5212
D1014
D1010
D1012
D5254
D1054
D5014D
D1010D
D5212Q
D1012Q
3/4 wire TX
+ Alarm
Duplicator
D5014
D1010
D5254
D1054
D1053
D5014D
D1010D
ANALOG OUTPUT
No Line monitoring
24 Vdc
Loop powered
D5020
D1020
D1021
D1022
Line monitoring
Open Circuit
Open/Short circuit
24 Vdc
D1020
D5020
D1021
TEMPERATURE
TC, RTD, Pot
+ Alarm
Duplicator
D5072
D1072
D5073
D1073
D5072D
D1072D

GM INTERNATIONAL
TECHNOLOGY FOR SAFETY

				Model
DIGITAL INPUT Dry Contact, Proximity Switch	No Line monitoring	24 Vdc	Relay Output	D5030
				D5032
				D1030
				D1032
		115-230 Vac		D1130
		24 Vdc	Transistor Output	D5031
				D5231
				D1031
				D1033
		24 Vdc	Current Output	D5034
				D1034
	Line monitoring	Local and Bus alarm	24 Vdc	Relay Output	D5030
					D5032
					D1030
					D1032
			115-230 Vac		D1130
			24 Vdc	Transistor Output	D5031
					D5231
					D1031
					D1033
		Remote alarm or duplicator	24 Vdc	Relay Output	D5030D
					D1030
					D1032D
			115-230 Vac		D1130
			24 Vdc	Transistor Output	D5031D
					D5231Q
					D1031
					D1033
		Transparent	24 Vdc	Current Output	D5034
					D1034
WEIGHING	Transparent				D1063
	+ 4-20 mA out		+ Alarm		D1064
FREQUENCY					D1035
	+ 4-20 mA out		+ Alarm		D1060


Model
DIGITAL OUTPUT
No Line monitoring
I.S.
Loop Powered
24 Vdc
DC Output
Relay Output
NE Load
ND Load
D5048
D1040
D1041
D1042
D1043
D5247
D5049
D1040
D1041
D1042
D1043
D1045
D1046
D1044
NE Load
ND Load
D1044
Non I.S.
Loop Powered
DC Output
Relay Output
NE Load
ND Load
D5280
D5281
D5091
D5291
D1092
D1092-069
D5090
D5290
D5290-SA
D5290-078
D5290-079
D5290-080
D1092
D1092-069
Line Monitoring
I.S.
Loop Powered
24 Vdc
DC Output
NE Load
ND Load
D5048
D1048
D5247
D5049
D1049
Non I.S.
24 Vdc
Relay Output
NE Load
ND Load
D5293
D1093
D5294
D1093



D5000 SERIES

Enhanced
Intrinsically Safe Isolators

Suitable for SIL 2
and SIL 3 applications



D5000

D5000 SERIES

CHARACTERISTICS

Universal mounting enclosure

All D5000 Modules can be mounted on **DIN-Rail**, **Power Bus** and **Termination Boards**.



Laser engraving
on entire enclosure and terminal blocks to provide accurate, safe and permanent marking of Intrinsic Safety parameters, schematic diagrams, connections and instructions.

D5000

D5000 SERIES

HIGH INTEGRITY

INTRINSICALLY SAFE ISOLATORS & SAFETY RELAYS

High performance

- High signal transfer accuracy and repeatability.
- Advanced circuitry provides very low heat dissipation, ensuring modules run cool despite their high density and functionality.
- SMD manufacturing for a long, reliable life.
- Complete absence of electrolytic capacitors ensures minimum 20 years lifetime.

Wide functionality

- Wide range of digital and analog I/O.
- SIL 3 Safety Relay contacts rated for 4 A or 10 A for direct switching of high loads.
- Three port galvanic isolation to eliminate noise, ground loop problems and to provide Intrinsic Safety without a high integrity safety earth connection.
- Line fault alarm detects open or short circuit of field cables.
- Optional power bus DIN-Rail connector.
- Standard Termination Board with custom connectors for integration into customized Boards.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.

General features

- More than 25 modules suitable for SIL 3 applications according to IEC 61508, IEC 61511.
- Independent power supply circuit for each channel.
- Dual channel units are equivalent to two single units because of the absence of common circuitry.
- Single channel versions available when required, to provide single loop integrity .
- Configuration components are easily accessed by removing the side cover.
- DIP switch configurability for easy field setup.
- LED indication for power, signal status and line fault conditions.
- Modules accept DC power supply over a wide range for 24 Vdc (20-30 Vdc) applications.
- Wide operating temp. range: -40 to +60/+70 °C.
- Installation in Zone 2 / Division 2.
- Certified for Offshore and Marine applications.

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

Save up to 50% space



6 mm per channel + Ultra-low power consumption



D5000 SERIES

FEATURES

Enclosure Characteristics

- High channel density result from innovative circuit design using advanced surface mount components.
- Plug-in screw terminal blocks to secure termination up to 2.5 mm^2.
- Configuration components are easily accessed by removing side cover.

Blue terminal blocks for Hazardous Area connections

Grey terminal blocks for Safe Area connections



Detachable cover for access to configuration component



Enhanced Power Bus mounting

Power Supply Voltage, 24 Vdc, can be applied to the module by connecting the voltage directly 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 standard DIN-Rail 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 Bus connection.

This signal can be 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.



Bus plug-in connector



Bus connector terminal



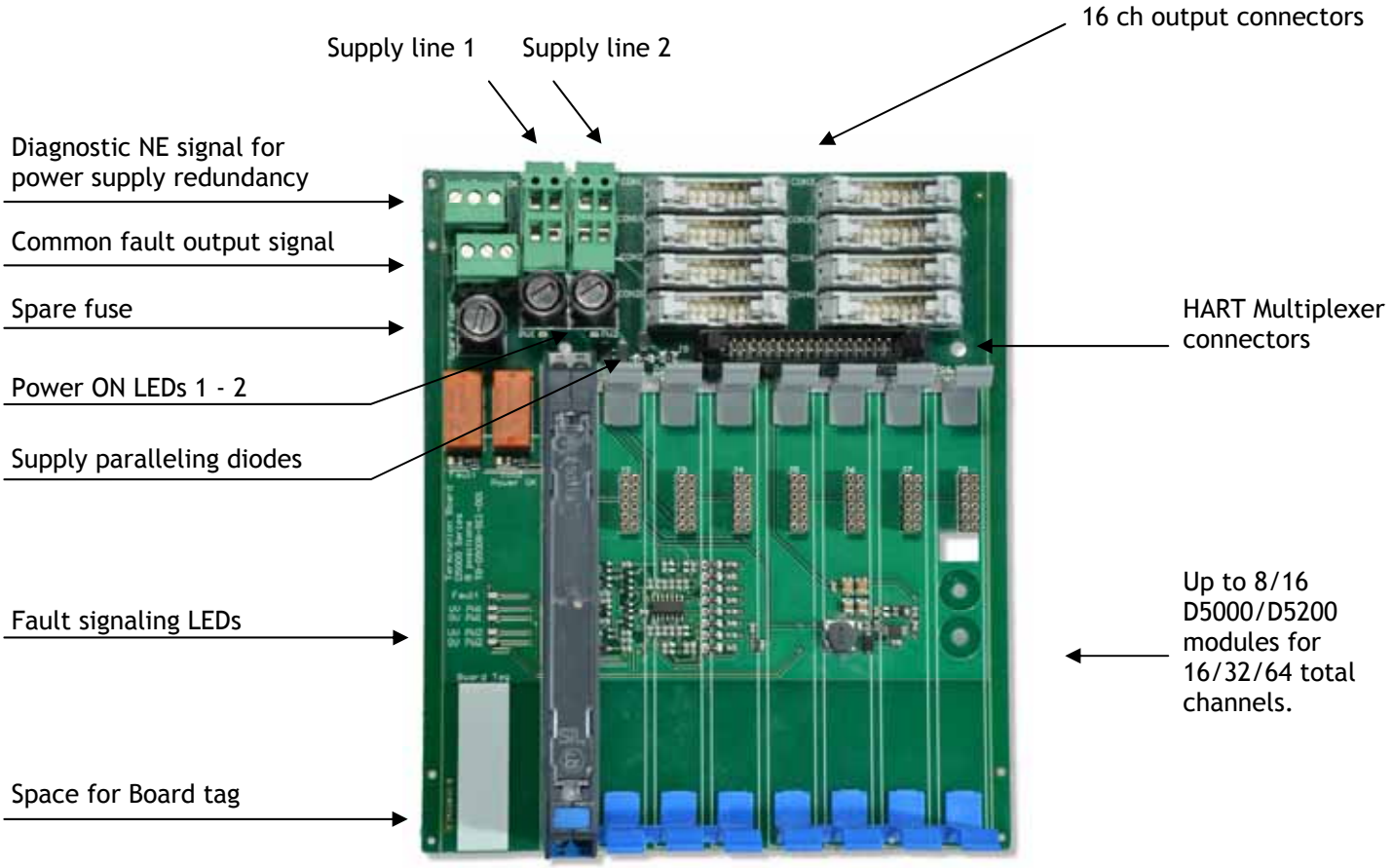
DIN-Rail stopper

D5000 SERIES

TERMINATION BOARDS

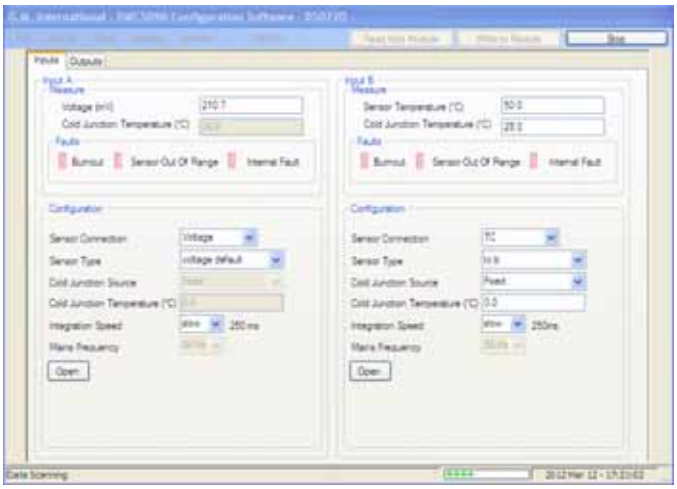
Characteristics

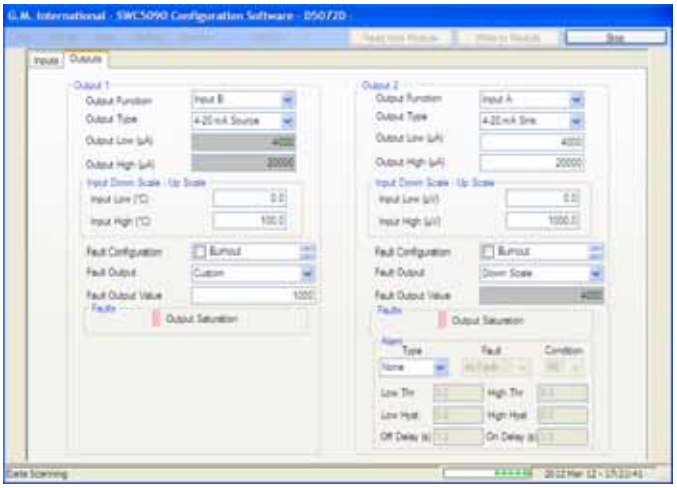
- Suitable to accept up to 8/16 D5000 or D5200 SIL 3 modules 12mm/22mm wide, single or double channel.
- AI - AO - DI - Temperature: double channels.
- DO - Signal converter, Encoders, Safety Relay: single channel.
- 24 Vdc Power supply terminal blocks can be disconnected from the board without disrupting the power to other boards connected in series.
- Boards are available with custom connectors to directly interface any system PLC / DCS / ESD.
- Boards are available also for 8+2 and 16+2 modules:
  the extra 2 modules (D5001S) provide separated fault signal relay contacts
  for power supply fault and input/output lines open and short circuit detection.
  Two D5001S modules can be paralleled for 1oo2 redundancy, to increase availability on fault detection.





D5000 SERIES CONFIGURATION





SWC5090 Software

The SWC5090 software is designed to provide a PC user interface to configure suitable D5000, D5200 modules.

It easily allows the user to:

- Read and write configuration parameters to the unit;
- Store and restore data to and from local hard drive for backup or archive;
- Load factory default configurations;
- Monitor real time Input values;
- Print a report sheet containing configuration parameters and additional information.

The SWC5090 is freely distributed at our website: http://www.gmintsrl.com





PPC5092 USB Adapter

PPC5092 interface allows the configuration of D5000, D5200 modules via **SWC5090** software. Modules are supplied via USB for programming and therefore do not need any external power supply.

PPC5092 comes with mini-USB dedicated cable and CD-Rom containing SWC5090 software.

D5000 - D5200 SELECTION TABLE

	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
ANALOG IN		**D5011S**	4-20 mA 2-Wires Tx only; Smart compatible	4-20 mA (source only)	1	20-30 Vdc	SIL 3
		**D5011D**			2		SIL 3
		**D5014S**	4-20 mA 2-Wires Active or Passive Tx; Smart compatible	4-20 mA (source or sink)	1		SIL 3
		**D5014D**			2	20-30 Vdc	SIL 3
		**D5014D**		Two duplicated outputs	1		SIL 3
		**D5212Q**	4-20 mA 2-Wires Passive Tx	4-20 mA + Modbus	4	20-30 Vdc	SIL 3
		**D5212Q**		Two duplicated outputs + Modbus	2		SIL 3
		**D5212Q**		One Triplicated + One single outputs + Modbus	2		SIL 3
		**D5212Q**		One Quadriplicated output + Modbus	1		SIL 3
		**D5254S**	4-20 mA 2-Wires Tx Active or Passive; Smart compatible	4-20 mA 2 Trip Amplifiers each whit 1 SPST (relay contact) + Modbus	1	20-30 Vdc	SIL 2
ANALOG OUT		**D5020S**	4-20 mA Analog Signal to I/P Converters, Electrovalves, Actuators and Displays; Smart compatible	4-20 mA Bus powered signal from DCS, PLC or other control devices. Two duplicated outputs.	1	20-30 Vdc	SIL 3
		**D5020D**			2		SIL 3

Configurable via PPC5092 with Software SWC5090

	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
DIGITAL IN		**D5030S**	Voltage free Contact, Proximity Switch Line fault detection Isolated inputs	1 SPDT (relay contact) + LED (fault status)	1	20-30 Vdc	SIL 3
		**D5030D**		1 SPST (relay contact) + 1 SPST (alarm or duplicator) + LED (fault status)	1		SIL 3
		**D5030D**		2 SPST (relay contact) + LED (fault status)	2		SIL 3
		**D5031S**	Voltage free Contact, Proximity Switch Line fault detection Isolated inputs	1 Open Collector + LED (fault status)	1	20-30 Vdc	SIL 3
		**D5031D**		2 Open Collectors + LED (fault status)	1		SIL 3
		**D5031D**		1 Open Collector + 1 O.C. (alarm duplicator) + LED (fault status)	2		SIL 3
		**D5231E**	Voltage free Contact, Proximity Switch Line fault detection	8 Open Collectors + LED (fault status) + Modbus	8	20-30 Vdc	SIL 2
		**D5032S**	Voltage free Contact, Proximity Switch Line fault detection Isolated inputs	1 SPDT (relay contact) + LED (fault status)	1	20-30 Vdc	SIL 3
		**D5032D**		1 SPST (relay contact) + 1 SPST (alarm or duplicator) + LED (fault status)	1		SIL 3
		**D5032D**		2 SPST (relay contact) + LED (fault status)	2		SIL 3
		**D5034S**	Voltage free Contact, Proximity Switch Line fault detection Isolated inputs	Transparent repeater of input status 0 to 8 mA range	1	20-30 Vdc	SIL 3
		**D5034D**			2		SIL 3

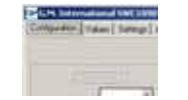
D5000 - D5200 SELECTION TABLE

	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
DIGITAL OUTPUT DRIVER		**D5048S**	NE solenoid valve, other control devices. Line open/short fault detection reflected on PLC.	Loop Powered control signal from safety PLC, DCS	1	Loop + 20-30 Vdc	SIL 3
		**D5049S**		Bus Powered control signal from safety PLC, DCS	1	20-30 Vdc	SIL 3
		**D5247S**	F&G solenoid valve, other control devices. Line open/ short fault detection. High Availability (1oo2)	Loop Powered control signal from safety PLC, DCS	1	Loop + 20-30 Vdc	SIL 3
SIGNAL CONV.		**D5060S**	0-50 KHz Magnetic Pickup or Proximity Switch	mA (source) or V Out, Pulse repeater Output + Modbus	1	20-30 Vdc	SIL 2
ENCODER		**D5265S**	Intrinsically Safe Encoder	Transparent repeater	1	20-30 Vdc	
TEMPERATURE CONVERTERS AND TRIP AMPLIFIERS		**D5072S**	Universal TC, 3/4-Wires RTD, Potentiometer, mV	4-20 mA (source or sink) + Modbus 1 Independent set point via 1 Solid State Relay	1	20-30 Vdc	SIL 2
		**D5072D**	Universal TC, 3-Wires RTD, Potentiometer, mV	4-20 mA (source or sink) + Modbus	2	20-30 Vdc	SIL 2
		**D5072D**		4-20 mA (source or sink) + Modbus Duplicator		20-30 Vdc	SIL 2
		**D5273S**	Universal TC, 3/4-Wires RTD, Pot, mV	4-20 mA (source or sink) 2 independent set points via 1 SPDT Relay each + Modbus	1	20-30 Vdc	SIL 2

Configurable via PPC5092 with Software SWC5090

More information on www.gmintsrl.com

ACCESSORIES

Image	Code	Description
	JDFT049	12 mm Power Bus Connector for DIN Rail Mounting 1 needed for each BUS Module
	JDFT050	22 mm Power Bus Connector for DIN Rail Mounting 1 needed for each BUS Module
	MCHP196	Bus End Stopper One for each end of Bus Required
	MOR017	Plug-in terminal block male, horizontal out, for Power Bus
	MOR022	Plug-in terminal block female, horizontal out, for Power Bus
	MCHP183	Blue Terminal Block Plug 12 mm
	MCHP184	Grey Terminal Block Plug 12 mm
	MCHP185	Blue Terminal Block Plug 22 mm
	MCHP186	Grey Terminal Block Plug 22 mm
	OPT5096	Kit for Bus Mounting: 1 x MOR017, 1 x MOR022, 2 x MCHP196
	PPC5092	PC Adapter required to configure programmable units; Mini USB Male to USB Port
	SWC5090	PC Software for Configuration



SAFETY RELAYS SERIES

High Integrity Safety Relays

Suitable for SIL 3 applications according to IEC 61508 and IEC 61511



Relays

SAFETY RELAY SERIES

FEATURES

Applications

When loads, such as valves or motors, cannot be driven directly by a safety PLC or by an emergency push button, an interposing relay becomes a necessity. In example, when the power required to switch the load is greater than what can be provided by the PLC or when multiple contacts are required to be driven by the same signal, the use of a relay is a must.

In today's high integrity applications a standard relay is no longer acceptable. Whether it is for a ESD, F&G, BMS or for any other critical application, a Safety (SIL 3) Relay must be used.

GMI SIL 3 Relays are available in various contact configurations and rating to cover the majority of applications; they are available with standard DC as well as with AC coil.

Typical applications are shut down or relief valves' control, Fire & Gas valve control, Turbine shut down motors, etc. For each application the specific Safety Function must be determined to select the correct Safety Relay. The Safety Function controls the operating condition of the SIF, therefore of the Safety Relay. Safety Functions can be basically divided in four types starting from the following operating conditions:



- NE Relay Coil - NC Relay Contacts (Load Normally Energized)
- NE Relay Coil - NO Relay Contacts (Load Normally De-Energized)
- ND Relay Coil - NO Relay Contacts (Load Normally De-Energized)
- ND Relay Coil - NC Relay Contacts (Load Normally Energized)

By "NE Relay Coil" we mean a High condition (power on) at the relay coil terminals and by "ND Relay Coil" we mean the exact opposite, a Low condition (power off).

NC or NO Relay Contacts determine whether power is available to the load under normal operating conditions or not; with NC contacts the load is Normally Energized and with NO contacts the load is Normally De-Energized.

The Safety Function is to revert the above operating conditions. For example, with NE relay coil and NC relay contacts, Safety Function is to disconnect power to the load by removing power at the relay coil (From High to Low condition); This is the most typical SIL 3 relay function for a NE Load. Or, with a NE relay coil and NO relay contacts, Safety Function is to power-on load by removing power at the relay coil (From High to Low condition).

Other aspects in selecting the safety relay are: the load's contacts rating; the number of contacts required to be driven by the same control signal; if a single line or both lines of the load must be switched ON or OFF.

For each GMI Safety Relay a data sheet containing schematics of all possible applications, as well as coil and contacts rating, is available.



Line Monitoring

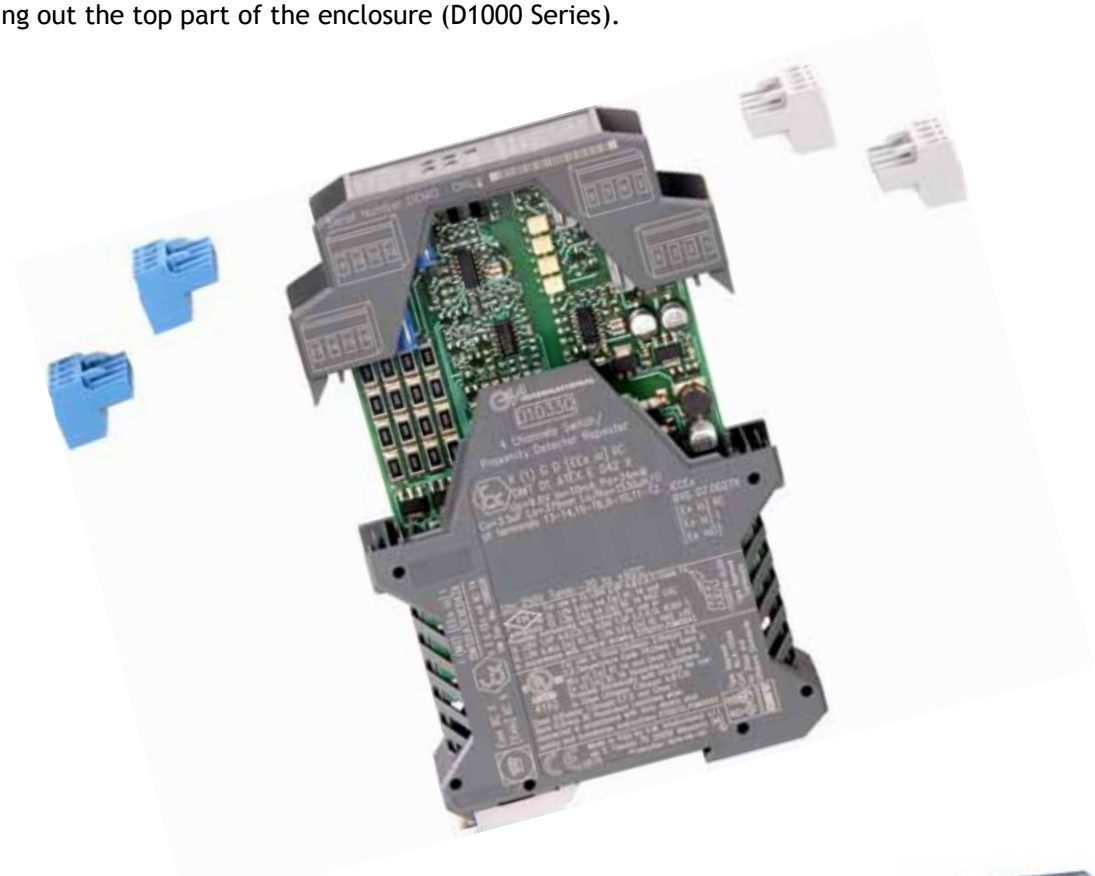
Some critical applications, such as ND systems (F&G), require constant monitoring of the line and load. When using a relay, it is no longer possible to use the Safety System inherent pulse or continuous monitoring feature to accomplish this task.

Models D5293S, D5294S and D1093S have a built-in diagnostic circuit that monitors line and load providing separate alarms.

All units are designed to filter the safety system line monitoring pulse, thus eliminating negative effects for relay and load. Such feature can be switched ON or OFF in the field.

Enclosure Characteristics

- Two types of enclosure are available in 12 or 22 mm widths.
  D5000 Series 12 or 22 mm; D1000 Series 22 mm.
- Plug-in screw terminal blocks to secure terminations up to 2.5 mm^2.
- DIP switches easily accessible by removing the side cover (D5000 series)
  or by sliding out the top part of the enclosure (D1000 Series).



Power Bus mounting

Safety Relays equipped with Line and Load diagnostic require a 24 Vdc supply source to operate. The power source can be connected through the unit's terminal blocks or via the optional power bus system available for both Series.



Termination Board compatibility

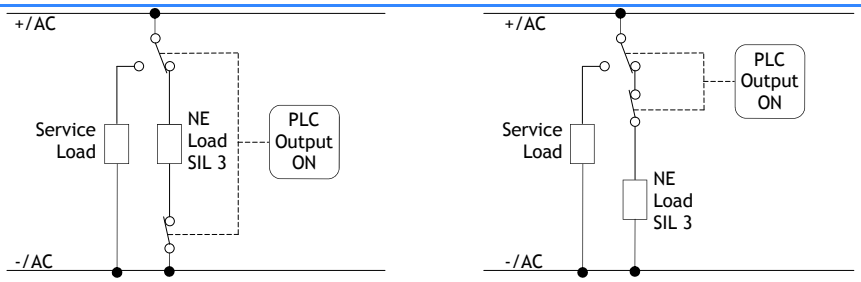
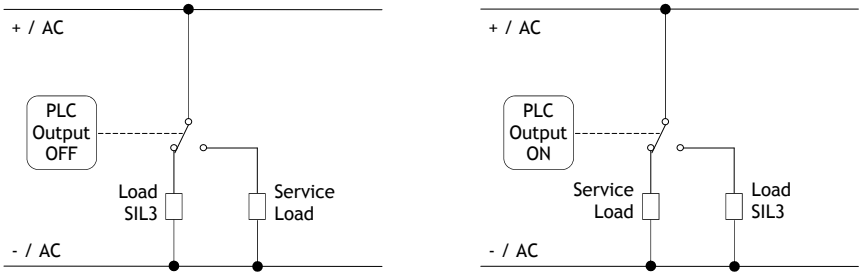
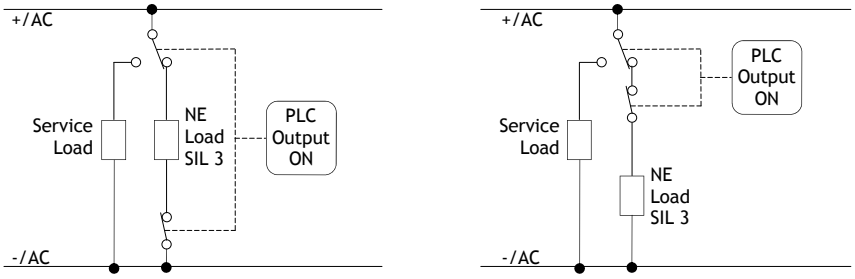
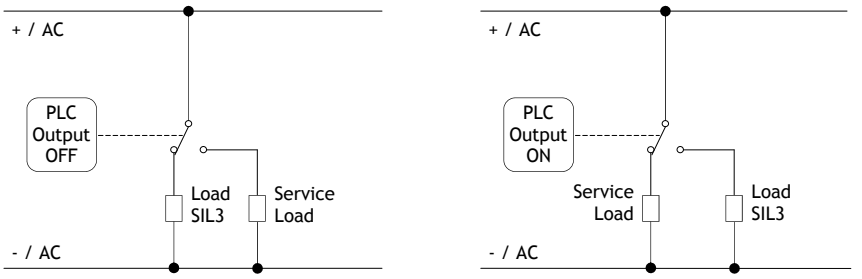
As for all modules of series D5000 and D1000, Safety Relays can be installed on Customized Termination Boards.

Available both for 12mm and 22mm modules.

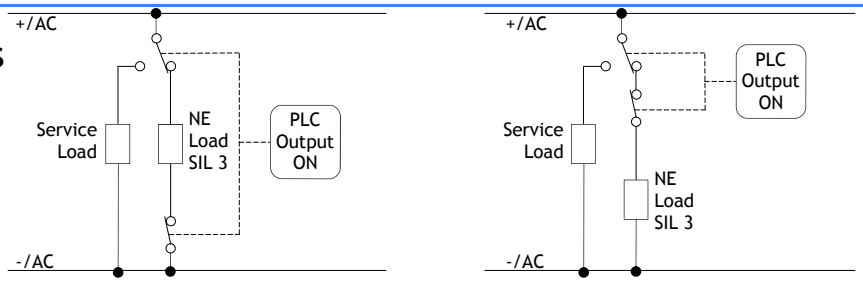
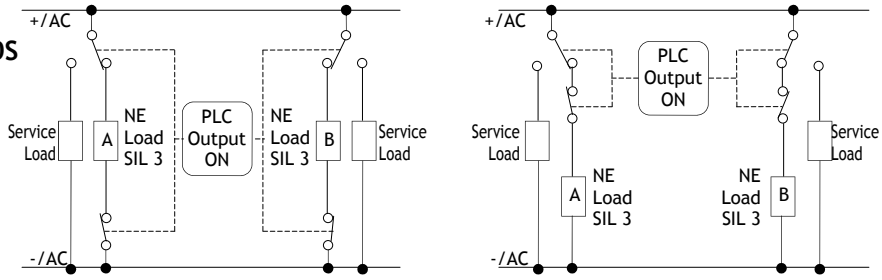
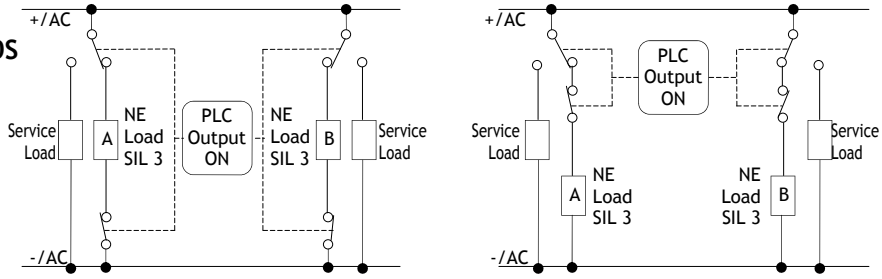
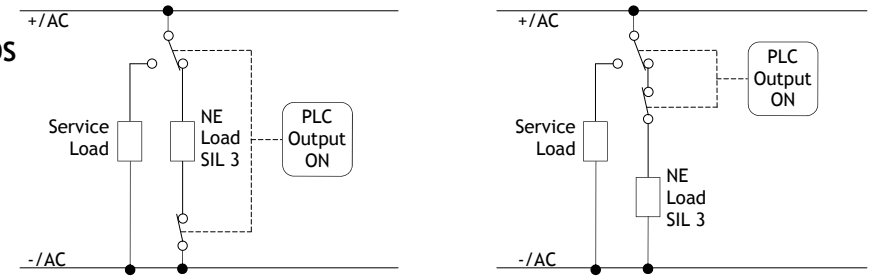




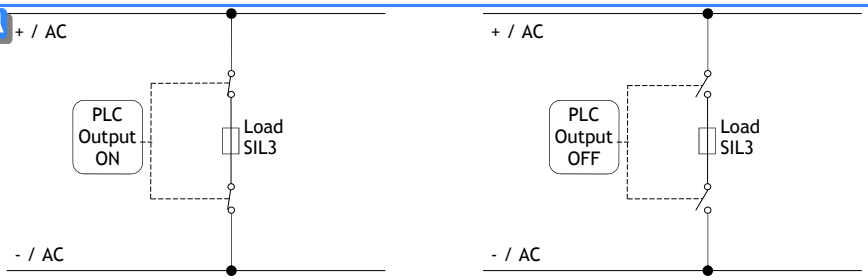
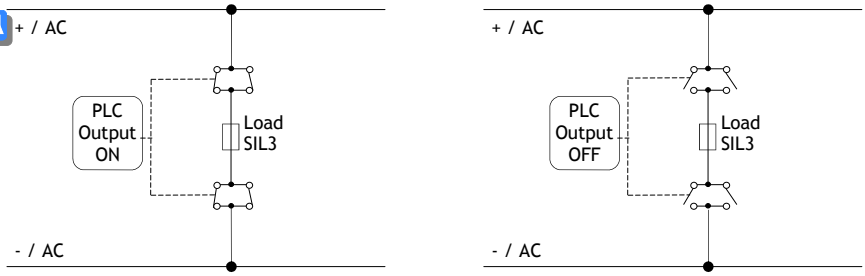
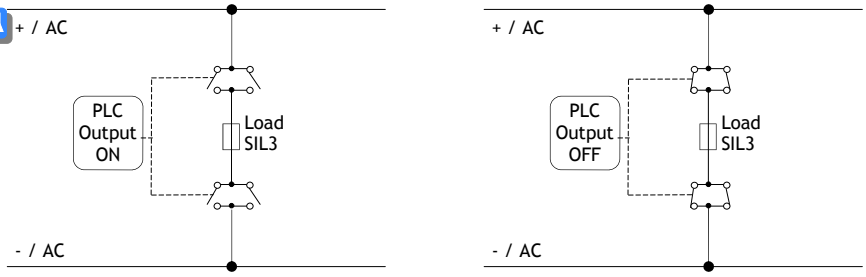
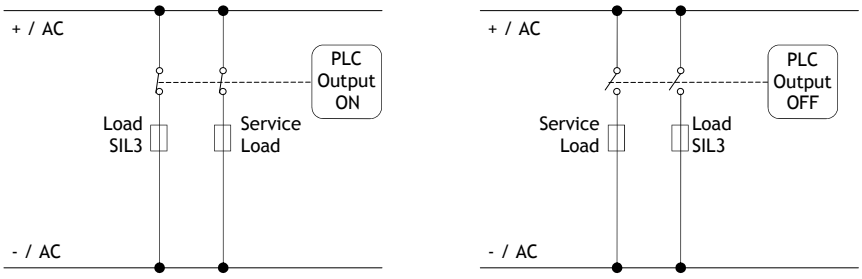
SAFETY RELAYS

Field device	Model	Connections	Rating	SIL level
	D5090S		4 A 250 Vac 1000 VA 4 A 250 Vdc 120 W 24 Vdc Coil	SIL 3
		Relay with NE Coil and Load (1-1). SIL 3 function: disconnect Load by disconnecting input (0-0). Can be used to disconnect one or both supply lines (see figures).		
	D5091S		4 A 250 Vac 1000 VA 4 A 250 Vdc 120 W 24 Vdc Coil	SIL 3
		Relay with ND Coil and ND or NE Load (0-0 or 0-1). SIL 3 function: connect Load by connecting input (1-1) or disconnect Load by connecting input (1-0) (see figures). To disconnect both supply lines, use two D5091S units in parallel.		
	D5290S		10 A 250 Vac 2500 VA 10 A 250 Vdc 300 W 24 Vdc Coil	SIL 3
		Relay with NE Coil and Load (1-1). SIL 3 function: disconnect Load by disconnecting input (0-0). Can be used to disconnect one or both supply lines (see figures).		
	D5291S		10 A 250 Vac 2500 VA 10 A 250 Vdc 300 W 24 Vdc Coil	SIL 3
		Relay with ND Coil and ND or NE Load (0-0 or 0-1). SIL 3 function: connect Load by connecting input (1-1) or disconnect Load by connecting input (1-0) (see figures). To disconnect both supply lines, use two D5291S units in parallel.		

SAFETY RELAYS

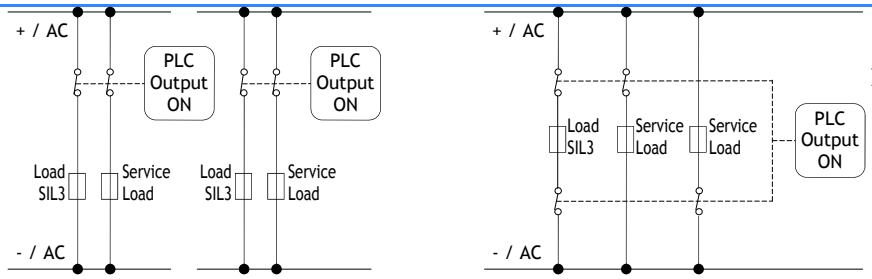
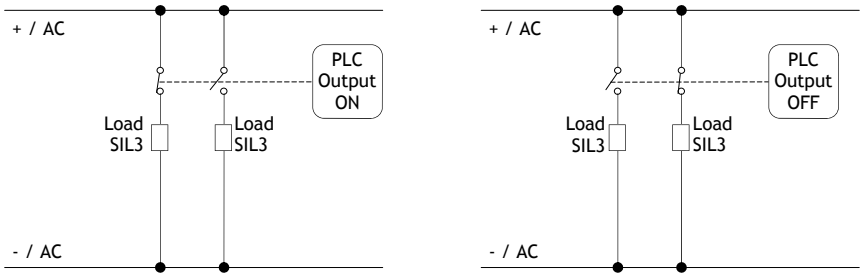
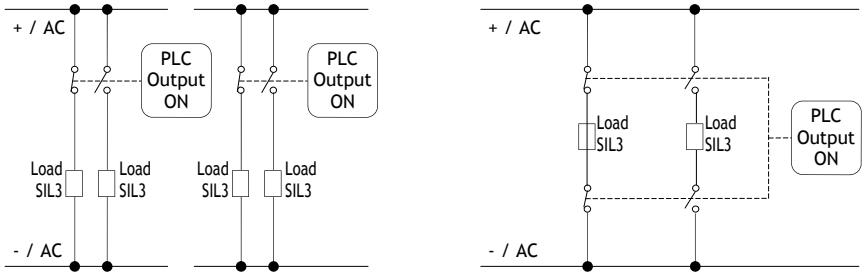
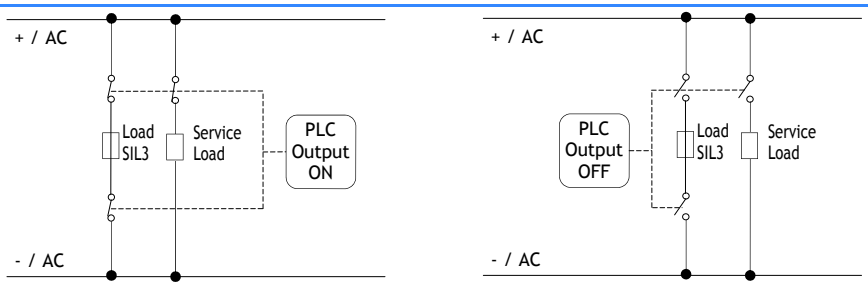
Field device	Model	Connections	Rating	SIL level
	D5290S /SA		10 A 250 Vac 2500 VA 10 A 250 Vdc 300 W 24 Vdc Coil	SIL 3
		Relay with NE Coil and Load (1-1). SIL 3 function: disconnect Load by disconnecting input (0-0). Can be used to disconnect one or both supply lines (see figures). Installation in safe area only and not compatible with pulse diagnostic.		
	D5290S -078		5 A 250 Vac 1250 VA 5 A 250 Vdc 175 W 24 Vdc Coil	SIL 3
		Relay for NE/ND Load with NE/ND Coil for interrupting up to 4 loads. SIL 3 function: configurable via external wiring. Can be used to disconnect one or both supply lines (see data sheet).		
	D5290S -079		5 A 250 Vac 1250 VA 5 A 250 Vdc 175 W 115 Vac Coil	SIL 3
		Relay for NE/ND Load with NE/ND Coil for interrupting up to 4 loads. SIL 3 function: configurable via external wiring. AC Coil. Can be used to disconnect one or both supply lines (see data sheet).		
	D5290S -080		10 A 250 Vac 2500 VA 10 A 250 Vdc 300 W 115 Vac Coil	SIL 3
		Relay with NE Coil and Load (1-1). AC Coil. SIL 3 function: disconnect Load by disconnecting input (0-0). Can be used to disconnect one or both supply lines (see figures).		

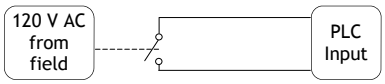
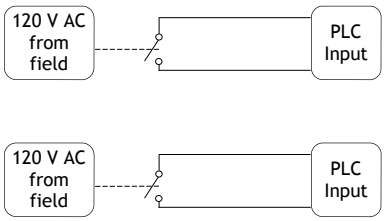
SAFETY RELAYS

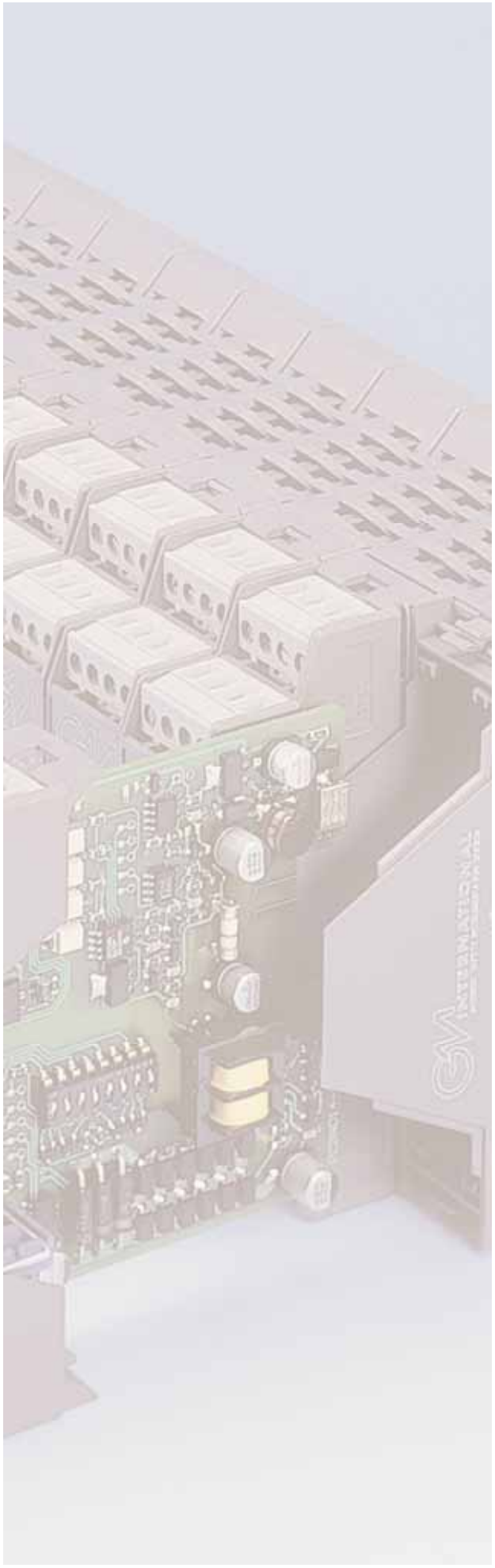
Field device	Model	Connections	Rating	SIL level
	D5293S		10 A 250 Vac 2500 VA 10 A 250 Vdc 300 W 24 Vdc Coil	SIL 3
		Relay with NE Coil and Load (1-1). SIL 3 function: disconnect Load by disconnecting input (0-0). Can be used to disconnect both supply lines (see figures). With smart line and load diagnostic function. Modbus RS-485 output.		
	D5294S		10 A 250 Vac 2500 VA 10 A 250 Vdc 300 W 24 Vdc Coil	SIL 3
		Relay with NE Coil and Load (1-1). SIL 3 function: disconnect Load by disconnecting input (0-0). Can be used to disconnect both supply lines (see figures). With smart line and load diagnostic function. Modbus RS-485 output.		
	D5295S		10 A 250 Vac 2500 VA 10 A 250 Vdc 300 W 24 Vdc Coil	SIL 3
		Relay with NE Coil and ND Load (1-0). SIL 3 function: connect Load by disconnecting input (1-0). Can be used to disconnect both supply lines (see figures). With smart line and load diagnostic function. Modbus RS-485 output.		
	D1092S		3 A 250 Vac 750 VA 3 A 125 Vdc 120 W 24 Vdc Coil	SIL 3
		Relay with NE and ND Coil and Load (1-1 , 0-0). SIL 3 function NE: disconnect Load by disconnecting input (0-0). SIL 3 function ND: connect Load by connecting input (1-1).		

Configurable via PPC5092 with Software SWC5090

SAFETY RELAYS

Field device	Model	Connections	Rating	SIL level
	D1092D		3 A 250 Vac 750 VA 3 A 125 Vdc 120 W 24 Vdc Coil	SIL 3
Dual channel Relay with NE and ND Coil and Load (1-1 , 0-0). SIL 3 function NE: disconnect Load by disconnecting input (0-0). SIL 3 function ND: connect Load by connecting input (1-1). Can be used to disconnect two loads or both supply lines.				
	D1092S -069		3 A 250 Vac 750 VA 3 A 125 Vdc 120 W 24 Vdc Coil	SIL 3
Relay with NE Coil and Load (1-1) and ND Coil and NE Load (0-1). SIL 3 function NE: disconnect Load by disconnecting input (0-0). SIL 3 function ND: disconnect Load by connecting input (1-0).				
	D1092D -069		3 A 250 Vac 750 VA 3 A 125 Vdc 120 W 24 Vdc Coil	SIL 3
Relay with NE Coil and Load (1-1) and ND Coil and NE Load (0-1). SIL 3 function NE: disconnect Load by disconnecting input (0-0). SIL 3 function ND: disconnect Load by connecting input (1-0). Can be used to disconnect two loads or both supply lines.				
	D1093S		3 A 250 Vac 750 VA 3 A 125 Vdc 120 W 24 Vdc Coil	SIL 3
Dual channel Relay with NE and ND Coil and Load (1-1 , 0-0). SIL 3 function NE: disconnect Load by disconnecting input (0-0). SIL 3 function ND: connect Load by connecting input (1-1). With line and load diagnostic function.				

Field device	Model	Connections	SIL level
SAFETY RELAYS	120 V AC FROM FIELD	**D5092S**	 Solid state NE Relay, 120 VAC input drive, 24 VDC rated voltage free output contact Input/Output isolation SIL 3 function NE: remove AC drive to open PLC input circuit.	SIL 3
	120 V AC FROM FIELD	**D5092D**	 Dual Solid state NE Relays, 120 VAC input drive, 24 VDC rated voltage free output contact Input/Output/Channel isolation SIL 3 function NE: remove AC drive to open PLC input circuit.	SIL 3



D1000 SERIES

Intrinsically Safe Isolators

Suitable for SIL 2
and SIL 3 applications



D1000

D1000 SERIES

DIN-RAIL MOUNTING

INTRINSICALLY SAFE ISOLATORS

D1000 Modules provide the most simple and cost effective means of implementing Intrinsic Safety into your Hazardous Areas / Locations applications.
A complete line of Isolators for every IS application.

High performance

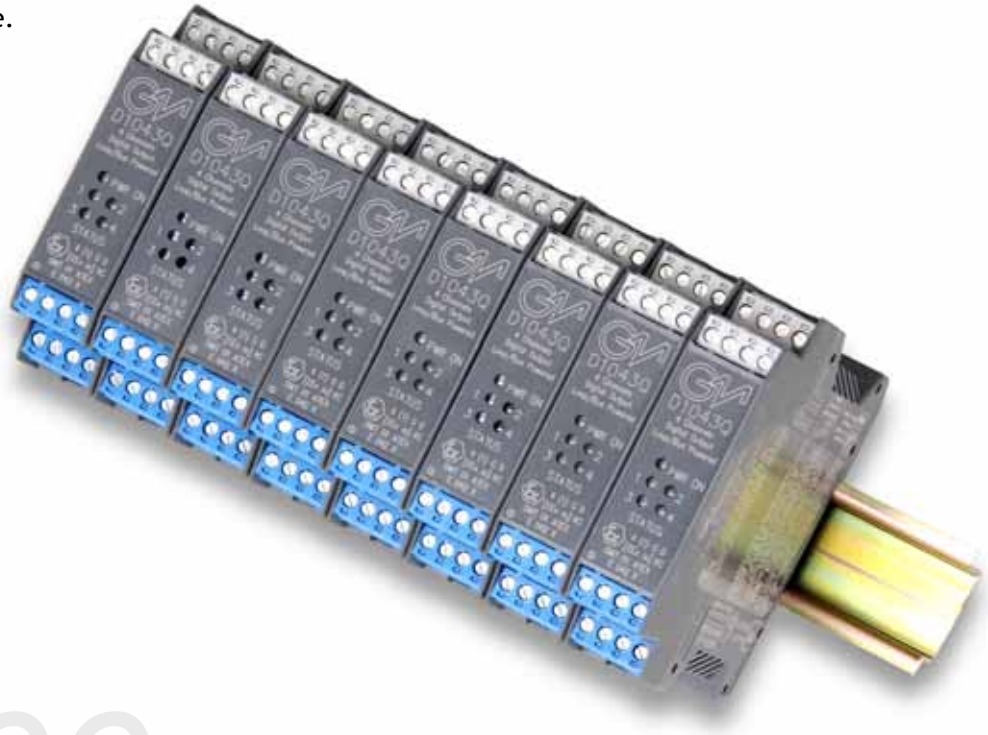
- High signal transfer accuracy and repeatability.
- Advanced circuitry provides low heat dissipation, ensuring modules run cool despite their high functionality.
- Low power consumption.
- SMD manufacturing for a long and reliable life.

Wide functionality

- Wide range of digital and analog I/Os.
- Relay contacts rated for 2 A to directly switch high loads.
- Three port galvanic isolation to eliminate noise, ground loop problems and to provide Intrinsic Safety without a high integrity safety earth connection.
- Line fault alarm detects open or short circuit of field cables.
- Optional power bus enclosure.

General features

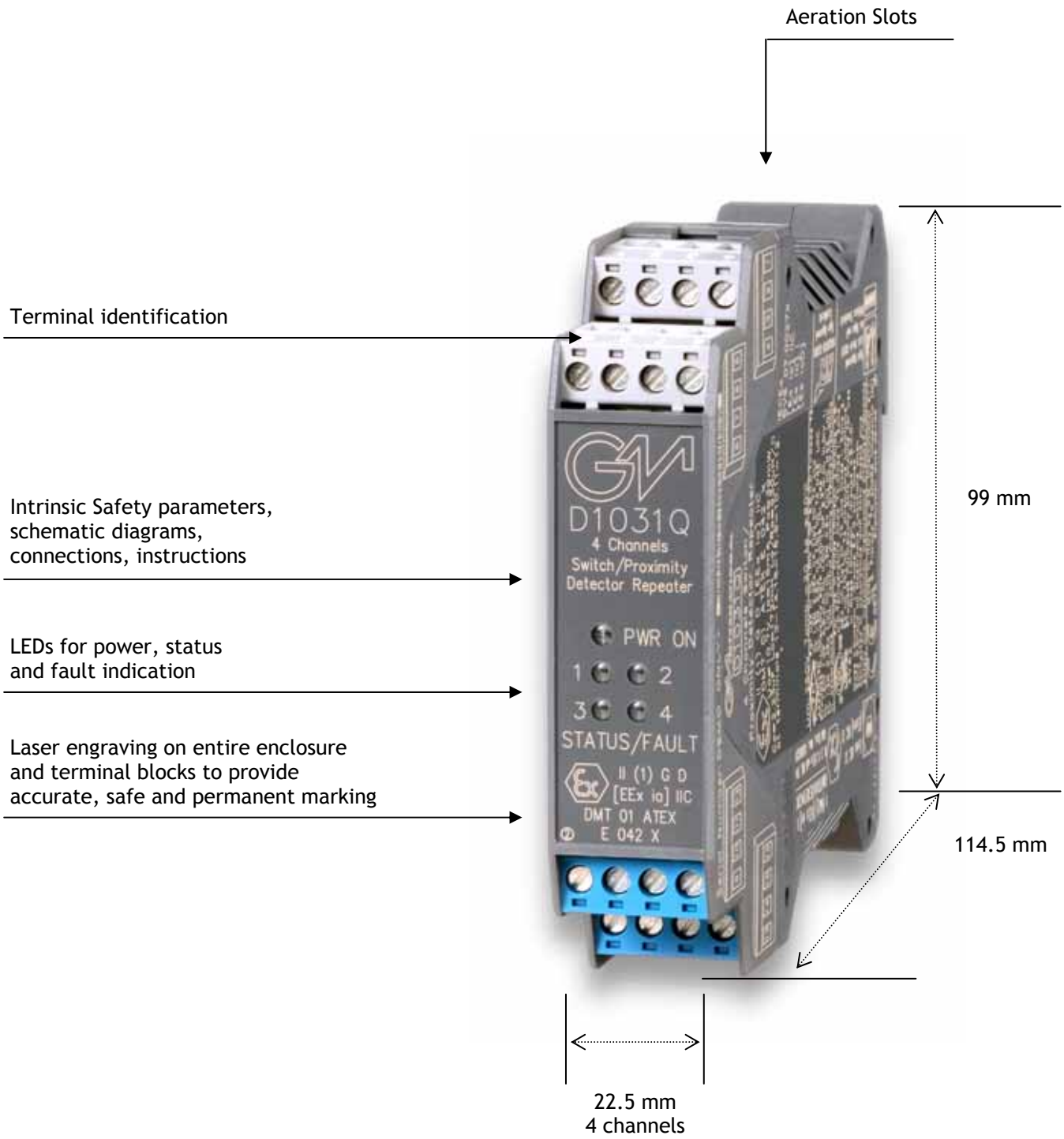
- More than 30 modules suitable for SIL 3 - SIL 2 applications according to IEC 61508, IEC 61511.
- Single channel versions available if required, to provide single loop integrity on Emergency Shut Down and Fire & Gas applications.
- Configuration using DIP switch for easy field setup.
- LED indication for power, signal status and line fault conditions.
- Modules accept DC power supply over a wide range for 12 or 24 Vdc applications.
- 2 modules (D1130 - D1180) can be powered from 85 to 264 Vac, 50-400 Hz, or from 100 to 350 Vdc.
- Wide operating temperature range (-20-+60°C).



D1000

D1000 SERIES

CHARACTERISTICS



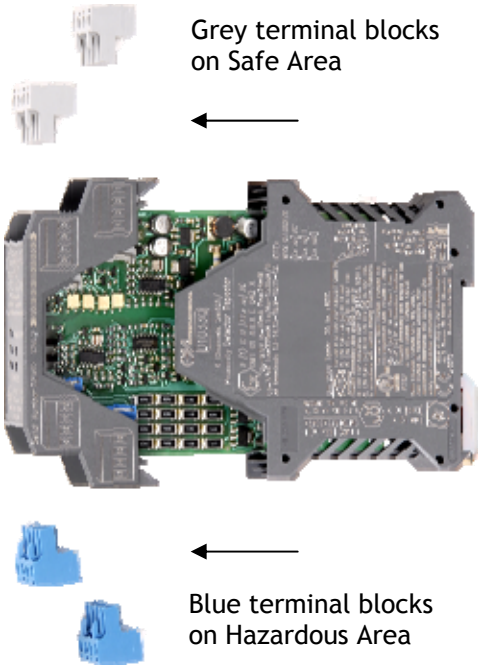
D1000 SERIES

FEATURES



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^2.
- Plug-in PCB can be removed for service or maintenance operations.



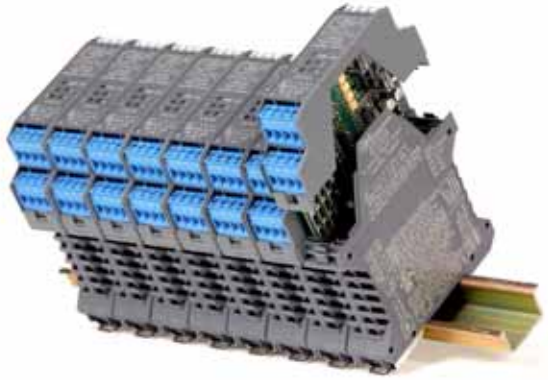
Grey terminal blocks on Safe Area

Blue terminal blocks on Hazardous Area

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



PACKING



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.

PBCO SERIES

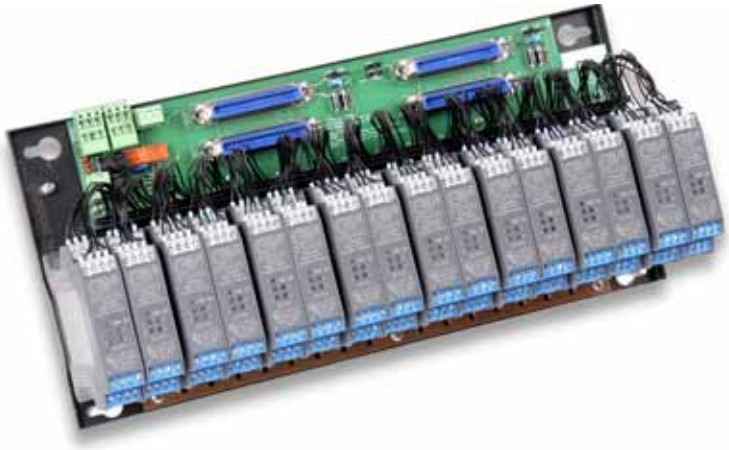
PBCO

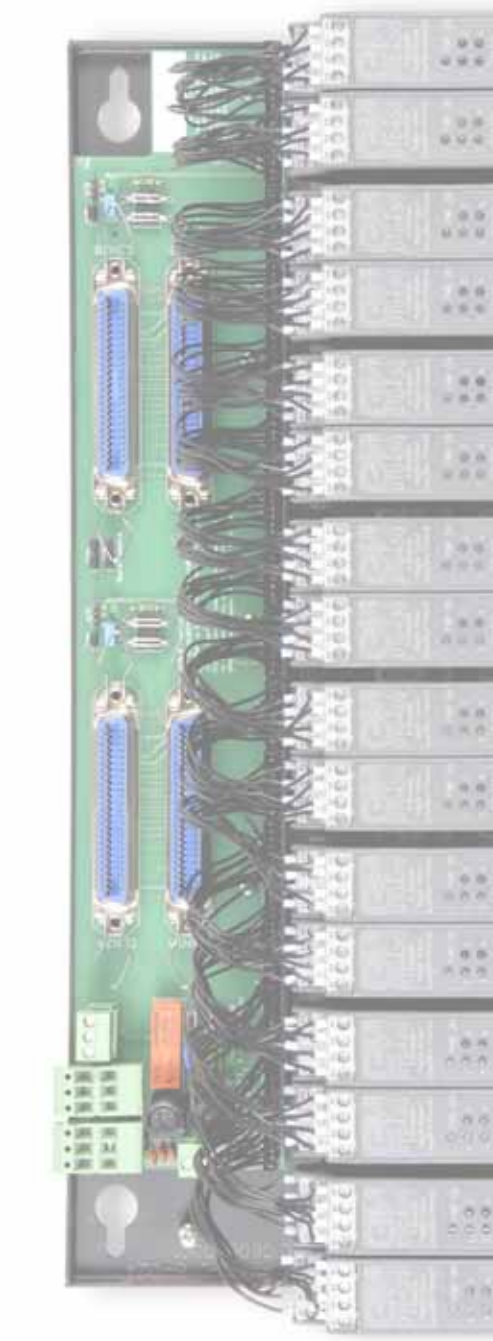
G.M. International offers many solutions for Customized Boards for an easy integration with instrumentation of manufacturers like **Invensys Foxboro**, **ABB**, **Triconex**, **Yokogawa**, **Honeywell, HIMA** and many more.

New Board models are engineered on customer request for any system or application: contact us for details.









D1000 SERIES

CONFIGURATION



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.

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 (see next page for details). The SWC1090 can also be downloaded from our website.

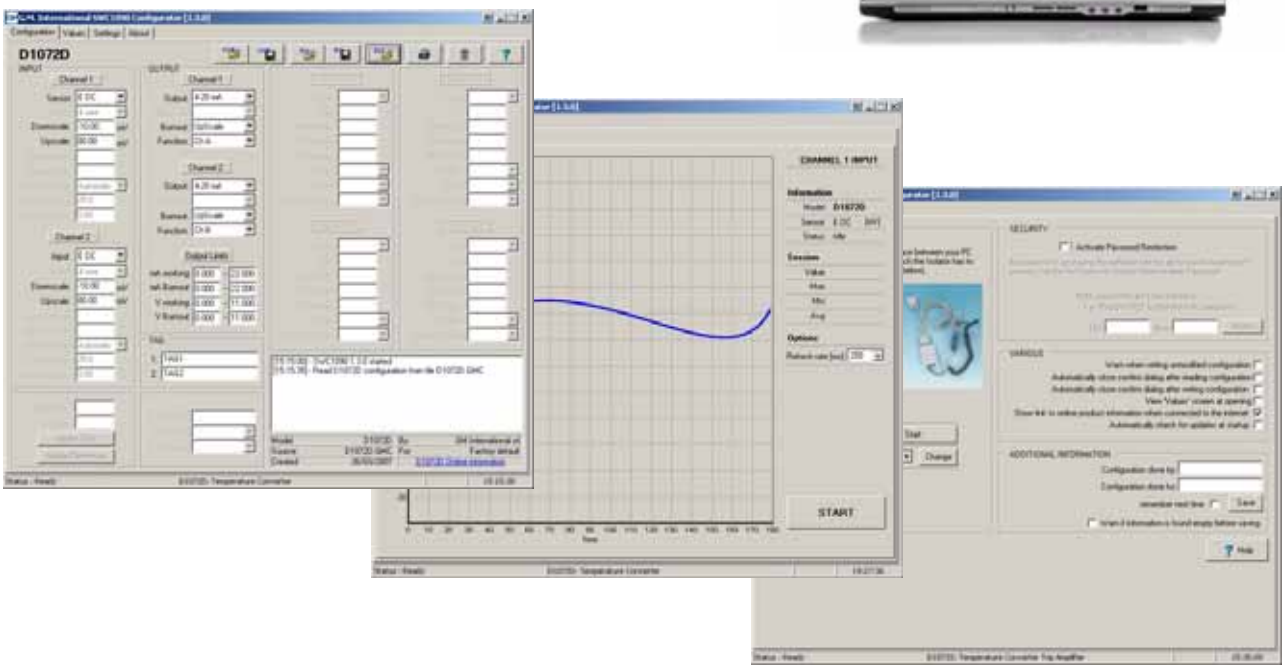
D1000 Modules which can be configured via PC are:

- **D1052** Analog Signal Converter, Duplicator, Adder, Subtractor;
- **D1053** Analog Signal Converter and Trip Amplifiers;
- **D1054** Repeater Power Supply and Trip Amplifiers;
- **D1060** Frequency-Pulse Converter, Repeater and Trip Amplifiers;
- **D1064** Load Cell/Strain Gauge Bridge Isolating Converter;
- **D1072** Temperature Signal Converter, Duplicator, Adder, Subtractor;
- **D1073** Temperature Signal Converter and Trip Amplifiers.

D1000 SERIES

CONFIGURATION





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.gmintsrl.com



Example Configuration Report Sheet

D1000

	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
ANALOG IN		**D1010S**	4-20 mA 0-20 mA 2/3-Wires Tx Smart compatible	4-20 mA 0-20 mA (source or sink) or 1-5 V 0-5 V	1	20-30 Vdc	SIL 3
		**D1010D**			2		SIL 3
		**D1010D**		Two duplicated outputs	2		SIL 3
		**D1010S-046**	4-20 mA 0-20 mA 2/3-Wires Tx Smart compatible Certified with lower safety parameters	4-20 mA 0-20 mA (source or sink) or 1-5 V 0-5 V	1	20-30 Vdc	-
		**D1010D-046**			2		-
		**D1012Q**	4-20 mA 2-Wires Tx	4-20 mA (source)	4	20-30 Vdc	-
		**D1014S**	4-20 mA 2-Wires Tx Hart compatible	4-20 mA (source or sink) or 1-5 V	1	10-30 Vdc	SIL 3
		**D1014D**			2		SIL 3
ANALOG OUT		**D1020S**	4-20 mA 0-20 mA Analog Signal to I/P Converters, Electrovalves, Actuators and Displays Smart compatible	4-20 mA 0-20 mA Bus powered signal from DCS, PLC or other control devices.	1	20-30 Vdc	SIL 2
		**D1020D**			2		SIL 2
		**D1021S**		plus line and load fault detection	1		SIL 2
FIRE & GAS DETECTOR		**D1022S**	1 to 40 mA Fire/Smoke Detector or Loop powered AI/AO isolator	1 to 40 mA to DCS, PLC or other control devices	1	Loop powered	-
		**D1022D**			2		-

D1000 - SELECTION TABLE

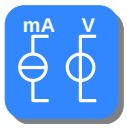
	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
DIGITAL IN		**D1030S**	Voltage free Contact, Proximity Switch Line fault detection	1 SPDT (relay contact) + 1 SPDT (alarm or duplicator) + LED (fault status)	1	20-30 Vdc	-
		**D1030D**		2 SPDT (relay contact) + LED (fault status)	2		-
		**D1130S**	Voltage free Contact, Proximity Switch Line fault detection	1 SPDT (relay contact) + 1 SPDT (alarm or duplicator) + LED (fault status)	1	85-264 Vac	-
		**D1130D**		2 SPDT (relay contact) + LED (fault status)	2	100-350 Vdc	-
		**D1031D**	Voltage free Contact, Proximity Switch Line fault detection	2 Open Collectors + 2 OC (alarm or duplicator) + LED (fault status)	2	10-30 Vdc	-
		**D1031Q**		4 Open Collectors + LED (fault status)	4		-
		**D1032D**	Voltage free Contact, Proximity Switch Line fault detection Isolated inputs	2 SPST (relay contact) + 2 SPST (alarm or duplicator) + LED (fault status)	2	20-30 Vdc	SIL 2
		**D1032Q**		4 SPST (relay contact) + LED (fault status)	4		SIL 2
		**D1033D**	Voltage free Contact, Proximity Switch Line fault detection Isolated inputs	2 Open Collectors + 2 OC (alarm or duplicator) + LED (fault status)	2	20-30 Vdc	SIL 2
		**D1033Q**		4 Open Collectors + LED (fault status)	4		SIL 2
		**D1034S**	Voltage free Contact, Proximity Switch Line fault detection Isolated inputs	Transparent repeater of input status 0 to 8 mA range	1	10-30 Vdc	SIL 3
		**D1034D**			2		SIL 3
		**D1035S**	0-50 KHz Magnetic Pickup or Proximity Switch	Voltage free SPST optocoupled OC transistor	1	10-30 Vdc	-

	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
DIGITAL OUT		**D1040Q**	Electrovalve, Audible Alarm or other devices	Voltage free Contact, Logic Level, Loop powered 24 Vdc from DCS, PLC or other control devices	4	21.5-30 Vdc	SIL 2 Bus powered or SIL 3 Loop powered
		**D1041Q**	LED		4		
		**D1042Q**	Electrovalve, Audible Alarm or other devices		4		
		**D1043Q**	Electrovalve, Audible Alarm or other devices		4		
		**D1044S**	1 SPDT (relay contact)	Voltage free Contact, Logic Level, from DCS, PLC or other control devices Bus powered	1	20-30 Vdc	-
		**D1044D**	2 SPDT (relay contact)		2		SIL 2
		**D1045Y**	Electrovalve, Audible Alarm or other devices	Voltage free Contact, Logic Level, Loop powered 24 Vdc from DCS, PLC or other control devices	2 alter-nate	21.5-30 Vdc	-
		**D1046Y**	Electrovalve, Audible Alarm or other devices		2 alter-nate		-
		**D1048S**	NE solenoid valve, other control devices. Line/Load fault detection.	Loop Powered control signal from safety PLC, DCS	1	20-30 Vdc	SIL 3
		**D1049S**	NE solenoid valve, other control devices. Line/Load fault detection.	Voltage free Contact, Logic Level, from DCS, PLC or other control devices. Bus powered	1	20-30 Vdc	SIL 3

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Configurable via PPC1090 or PPC1092 via Software SWC1090

D1000 - SELECTION TABLE

Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
SIGNAL CONVERTERS	 **D1052S**	4-20 mA, 0-20 mA 1-5 V, 0-5 V, 2-10 V, 0-10 V from 3/4-Wires powered Tx or other instrument	4-20 mA, 0-20 mA (source) or 1-5 V, 0-5 V, 2-10 V, 0-10 V	1	10-30 Vdc	-
	 **D1052D**			2		-
SIGNAL CONVERTER + TRIP AMPLIFIERS	 **D1053S**	4-20 mA, 0-20 mA 1-5 V, 0-5 V, 2-10 V, 0-10 V	4-20 mA, 0-20 mA (source) or 1-5 V, 0-5 V, 2-10 V, 0-10 V 2 Independent set points via 2 SPST Relays	1	20-30 Vdc	SIL 2
	 **D1054S**	4-20 mA, 0-20 mA 2/3-Wires Tx, Smart compatible		1	10-30 Vdc	SIL 2
	 **D1073S**	Universal TC, 3/4-Wires RTD, Potentiometer, mV		1	20-30 Vdc	SIL 2
	 **D1060S**	0-50 KHz Magnetic Pickup or Proximity Switch	mA (source) or V Out, Pulse repeater Output	1	10-30 Vdc	-
SERIAL CONVERT.	 **D1061S**	RS-485, RS-422 up to 1.5 Mbit/s	RS-485, RS-422, RS-232	1	20-30 Vdc	-
VIBRATION INTERFACE	 **D1062S**	Vibration Transducers, Accelerometers, 2/3-Wires sensors	Transparent input repeater	1	20-30 Vdc	SIL 2
LOAD CELLS ISOLATORS CONVERTERS	 **D1063S**	Up to 4, 350 Ω, 6-Wires Load Cells in parallel.	Transparent input repeater.	1	20-30 Vdc	-
	 **D1064S**		mA (source or sink) and V Output and MODBUS RTU	1		-
DIGITAL IN 3-WIRES SENSORS	 **D1080D**	3-Wires sensors, Electro-optic, photo-cells and other devices	2 SPDT (relay contact)	2	20-30 Vdc	-
	 **D1180D**			2	85-264 Vac 100-350 Vdc	-
	 **D1081D**		2 Voltage free SPST optocoupled OC transistors	2	14-30 Vdc	-

	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
TEMPERATURE CONVERTERS		**D1072S**	Universal TC, 3/4-Wires RTD, Potentiometer, mV	4-20 mA, 0-20 mA (source) or 1-5 V, 0-5 V, 2-10 V, 0-10 V	1	10-30 Vdc	SIL 2
		**D1072D**			2		SIL 2
		**D1072D**		Two duplicated outputs	2		SIL 2
		**D1010S-054**	-5 to +55 mV Thermocouple.	4-20 mA (source) Fast response time for temperature measurements in critical applications (i.e: gas turbines)	1	20-30 Vdc	SIL 3
		**D1010S-056**	-5 to +35 mV Thermocouple.		1		SIL 3
		**D1010S-057**	-5 to +10 mV Thermocouple.		1		SIL 3
SHUNT RESISTOR		**D1090Q**	Separately powered 4-20 mA, 0-20 mA	10 to 50 mV or 0 to 50 mV to D2010M, D2011M	4	-	-
		**D1094Q**	Separately powered 0-5 V, 0-10 V	0 to 20 mV or 0 to 40 mV to D2010M, D2011M	4	-	-
POWER SUPPLIES		**PSD1000**	Installation in Safe Area or Zone 2 / Div. 2	24 V, 500 mA to power D1000 Series Modules	1	95-264 Vac 115-350 Vdc	-
		**PSD1001**	15 V, 20 mA 3-Wires Tx or other devices	24 Vdc	4	21.5-30 Vdc	SIL 2 Bus powered or SIL 3 Loop powered
		**PSD 1001C**	13.5 V, 100 mA 3-Wires Tx or other devices	24 Vdc	1		
		**PSU1003**	5 V, 160 mA	PCB Mounting	1	via PSD1001C	SIL 2 or SIL 3 redun-dant
		**PSD1004**		DIN-Rail mounting	1		

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
	**OPT1091**	Cold Junction Compensator
	**OPT1096**	Kit for Bus Mounting: 2 x MOR016, 1 x MOR017, 1 x MOR022, 2 x MCHP065
	**/B**	Power Bus Enclosure (see next page)
	**D1091S**	Common Bus Alarm Module with SPDT Relay Fault Output indication
	**PPC1090**	Pocket Portable Configurator with cables
	**PPC1092**	RS-232 Serial Adapter for Configuration via PC, includes USBADAPT and cables
	**USBADAPT**	USB to RS-232 Adapter for PC
	**SWC1090**	PC Software for Configuration (free of charge at www.gmintsrl.com)
	**D1000R**	19” Rack Unit, 3 units high, suitable for 16 modules

More information on www.gmintsrl.com

EI1000ADP SERIES



G.M. International offers continuity in the service of Elcon Instruments 1000 series (no longer available from the manufacturer).

Features:

- ATEX, FM, FM-C Certifications.
- Interchangeability with Elcon 1000 Series modules.
- Possibility to replace Elcon modules without modifying any wiring or connections.
- Use of the same Elcon boards.
- Identification using the same Elcon part-number.

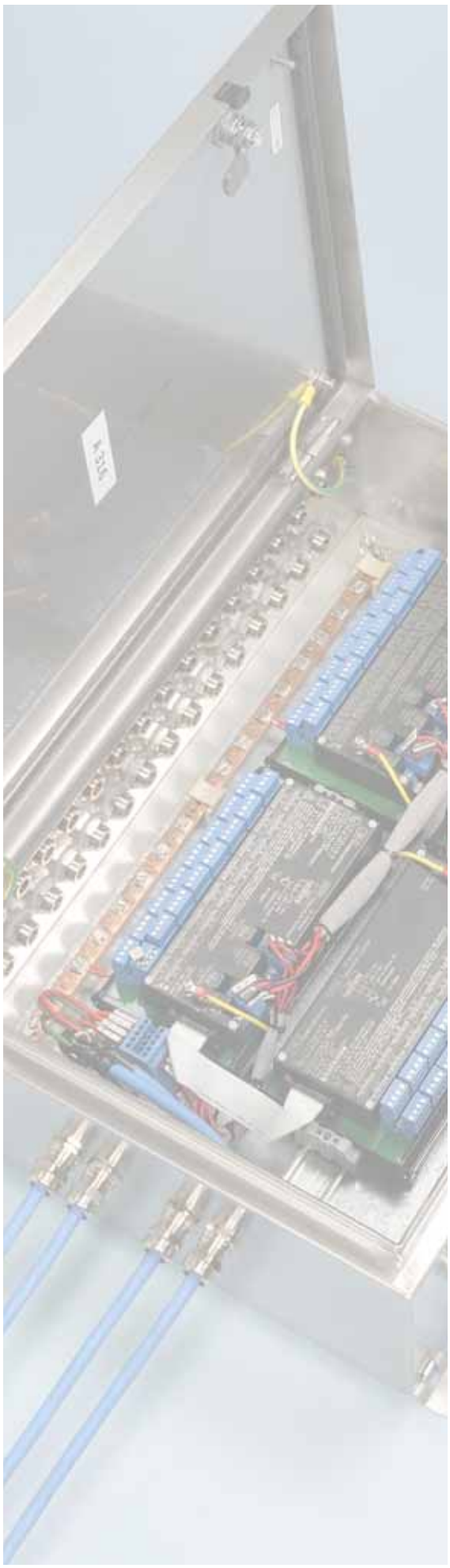


List of available models:

Model	Description	Ch.
	Analog Input, Power Supply Repeaters	
1021	Analog Input Repeater, Smart Tx Compatible (non Honeywell Compatible)	1
1022	Analog Input Repeater, Smart Tx Compatible (non Honeywell Compatible)	2
1023	Analog Input Repeater, Floating Output	1
1025	Analog Input Repeater, Smart Tx Compatible	1
1025G	Analog Input Repeater, Smart Tx Compatible, 3 Port Isolation, Isc=93mA for wider applications	1
1026	Analog Input Repeater, Smart Tx Compatible	2
1026G	Analog Input Repeater, Smart Tx Compatible, 3 Port Isolation, Isc=93mA for wider applications	2
1029	Analog Input Repeater, Smart Tx Compatible Sink/Source Output, Isc=93mA for wider applic.	1
1030	Analog Input Repeater, Smart Tx Compatible Sink/Source Output, Isc=93mA for wider applic.	2
	Analog Input, Power Supply Repeater and Trip Amplifier	
1020	Analog Input (Tx or Current Source), Analog Repeater and 1 Set point Trip Amplifier	1
1027	Analog Input (Tx or Current Source), Analog Repeater and 2 Set point Trip Amplifiers	1
	Analog Output, Powered Isolating Drivers for I/P	
1031	Analog Output Isolating Driver, Bus Powered	1
1032	Analog Output Isolating Driver, Bus Powered	2
1033	Analog Output Isolating Driver, Bus Powered (Not Loop Powered)	1
1034	Analog Output Isolating Driver, Bus Powered (Not Loop Powered)	2
1037	Analog Output Isolating Driver, Bus Powered for Smart I/P and Positioner	1
1038	Analog Output Isolating Driver, Bus Powered for Smart I/P and Positioner	2

Model	Description	Ch.
	Fire and Smoke Detectors Repeaters	
1035	Loop Powered Isolator for Fire and Smoke Detectors	1
1036	Loop Powered Isolator for Fire and Smoke Detectors	2
1039	Loop Powered Isolator for Fire and Smoke Detectors, Isc=93mA for wider applications	1
1040	Loop Powered Isolator for Fire and Smoke Detectors, Isc=93mA for wider applications	2
	Analog Signal and Temperature Converters Fully Programmable	
1061	TC or mV Input, mA or V Output (Temperature Linear Output)	1
1062	TC or mV Input, mA or V Output (Temperature Linear Output)	2
1065	TC or mV Input, mV Output (mV Linear Output)	1
1066	TC or mV Input, mV Output (mV Linear Output)	2
1071	RTD or Potentiometer Input, mA or V Output (Temperature Linear Output)	1
1072	RTD or Potentiometer Input, mA or V Output (Temperature Linear Output)	2
1073	RTD or Potentiometer Input, mA or V Output (Temperature Linear Output) and 3 Port Isolation	1
1074	RTD or Potentiometer Input, mA or V Output (Temperature Linear Output) and 3 Port Isolation	2
1090	Strain Gauge or Load Cell Input, mA or V Output	1
	Digital Input Switch/Proximity Repeater	
1821	Switch/Proximity Input Repeater, Relay Output (1 x DPDT)	1
1822	Switch/Proximity Input Repeater, Relay Output (2 x SPDT)	2
1841	Switch/Proximity Input Repeater, Transistor Output	1
1842	Switch/Proximity Input Repeater, Transistor Output	2
	Digital Output Drivers for Solenoid Valves, LEDs, Horns	
1861	SPDT Relay Output	1
1862	SPDT Relay Output	2
1871	Digital Output Driver for Solenoid Valves	1
1872	Digital Output Driver for Solenoid Valves	2
1873	Digital Output Driver for Solenoid Valves	1
1874	Digital Output Driver for Solenoid Valves	2
1881	Digital Output Driver for Solenoid Valves	1
1882	Digital Output Driver for Solenoid Valves	2
	Frequency to Analog Converter + Pulse Repeater	
1891	Pulse Input, Proximity or Magnetic Sensor, mA or V Output and Pulse Repeater	1
1893	Pulse Input, Proximity or Magnetic Sensor, Pulse Repeater	1
	Analog Signal and temperature Trip Amplifiers Fully Programmable	
1011	mA or V Input, mA or V Output, fully programmable	1
1012	mA or V Input, mA or V Output, fully programmable	2
1310	mA or V Input, 1 Set point, Relay Output, 1 x DPST	1
1311	mA or V Input, 2 Set point, Relay Output, 2 x SPST	1
1360	TC or mV Input, 1 Set point, Relay Output, 1 x DPST	1
1361	TC or mV Input, 2 Set point, Relay Output, 2 x SPST	1
1370	RTD or Potentiometer Input, 1 Set point, Relay Output, 1 x DPST	1
1371	RTD or Potentiometer Input, 2 Set point, Relay Output, 2 x SPST	1
1901	mA or V Input, 2 Set point, Relay Output, 2 x SPST, Non Intrinsically Safe	1

EI1000ADP



D2000M SERIES

Intrinsically Safe Multiplexer

For Analog and Digital Inputs from Zone 0



D2000M

D2000M SERIES

- High density, up to 256 Analog Inputs (TC, RTD, mV) and up to 128 digital inputs (contact / proximity) in the same system (expandable up to 7936 inputs)
- Robust Isolation (± 200 V channel to channel), provides high immunity against interference and ground loops
- Intrinsically safe for installation in Zone 1 or 2
- Field units can be placed up to 5 km from Gateway
- High accuracy 18 bit A/D converter
- Redundant communication lines
- Programmable via PC (RS232) and Modbus (RS485)
- Repeats input contacts via Relay or Transistor outputs
- Reduces field wiring and installation costs
- Eliminates the need of PLC - DCS I/O cards.
- Field unit operating temperature: - 40 to + 60 Celsius.
- AISI 316 stainless steel enclosures are available for field units (Series GM2300).
- Gateway D2050M can be installed in Zone 1 / Div. 1 by using an explosion proof enclosure.



D2010M Temperature Unit



D2050M Gateway Unit

D2010M - D2011M

ANALOG / TEMPERATURE MULTIPLEXER UNIT

- II 1 G EEx ia IIC T4
- 16 Channels per Unit, each for 2-3-4 wire RTD, Pt100, Pt50, Ni 100, Cu100, Cu53, Cu50, Cu46, TC Type A1, A2, A3, B, E, J, K, L, Lr, N, R, S, T, U.
- Up to 16 Units per System
- 256 Channels are scanned in 1500 ms
- Redundant Communication with gateway D2050M
- PC Programmable via SWC2090 software
- Zone 1 / Div. 1 Installation
- Operating Temperature - 40 to + 60 ° Celsius

D2030M

SWITCH / PROXIMITY MULTIPLEXER UNIT

- II 1 G EEx ia IIC T4
- 32 Input Channels per Unit
- Up to 4 Units per System
- Input from Contact-Proximity Sensors
- 128 Channels are scanned in 50 ms
- Redundant Communication with D2050M Gateway
- PC Programmable via SWC2090 software
- Zone 1 / Div. 1 Installation
- Operating Temperature - 40 to + 60 ° Celsius

D2000M

D2050M

GATEWAY MULTIPLEXER UNIT

D2010M
D2030M

- II (1) G [EEx ia] IIC
- Supply 24 V - 350 mA
- Redundant MODBUS RTU - RS485 lines up to 115200 bauds
- 1 RS-232 line for configuration via PC
- Suitable to drive contact/proximity output repeaters
- Safe Area Installation or Zone 1 / Div. 1 when mounted in an explosion proof housing
- Operating Temperature - 20 to + 60 °Celsius

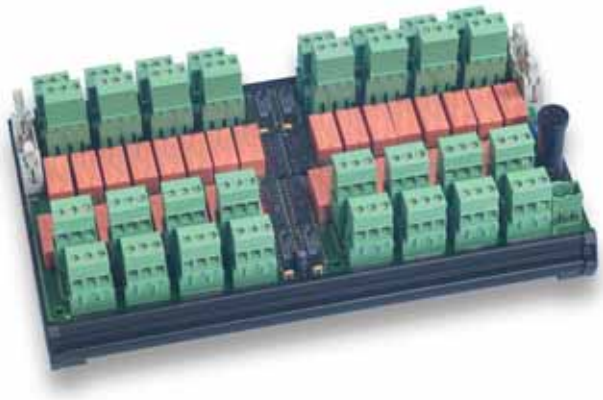
D2052M - D2053M

CONTACT / PROXIMITY OUTPUT REPEATER

- 32 Isolated Channels with SPDT Relay contacts (D2052M) or Open Collector Transistors (D2053M)
- 128 Channels are scanned in 50 ms
- Operating Temperature - 20 to + 60 ° Celsius
- Safe Area Installation or Zone 1 / Div. 1 when mounted in an explosion proof housing

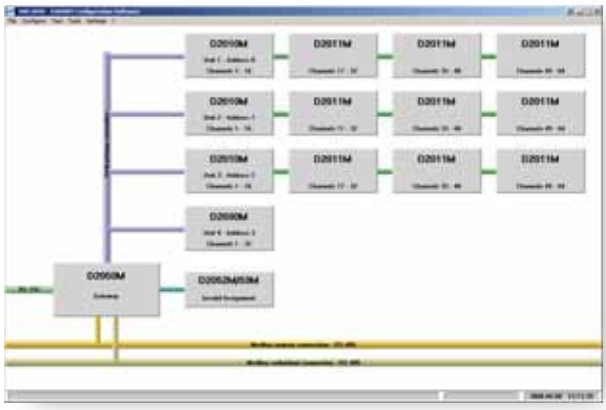


GM2330 Enclosure



D2052M Output Repeater

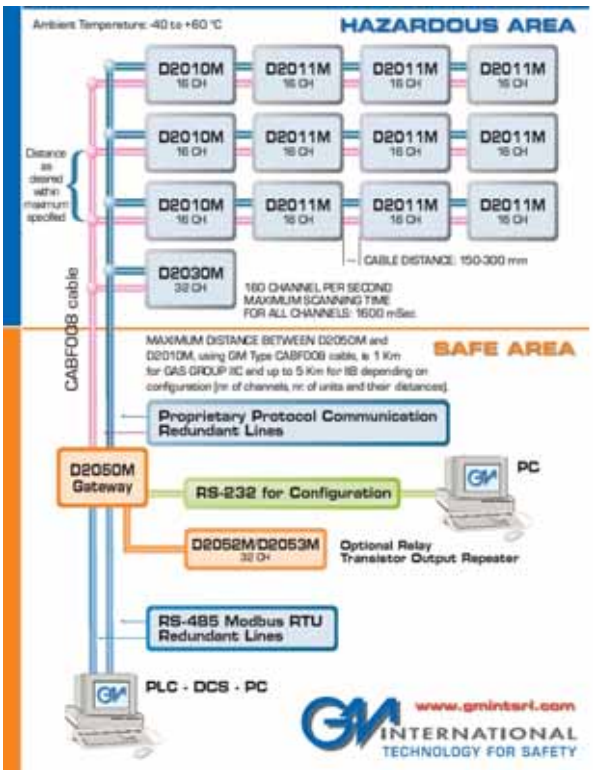
SWC2090



SOFTWARE CONFIGURATOR FOR D2000M

- Configure and monitor the entire system with your PC / Laptop via RS232 and/or RS485 connections
- Guided user interface
- Print complete report sheets
- Save configurations to file for backup
- Multilanguage

ARCHITECTURE EXAMPLE

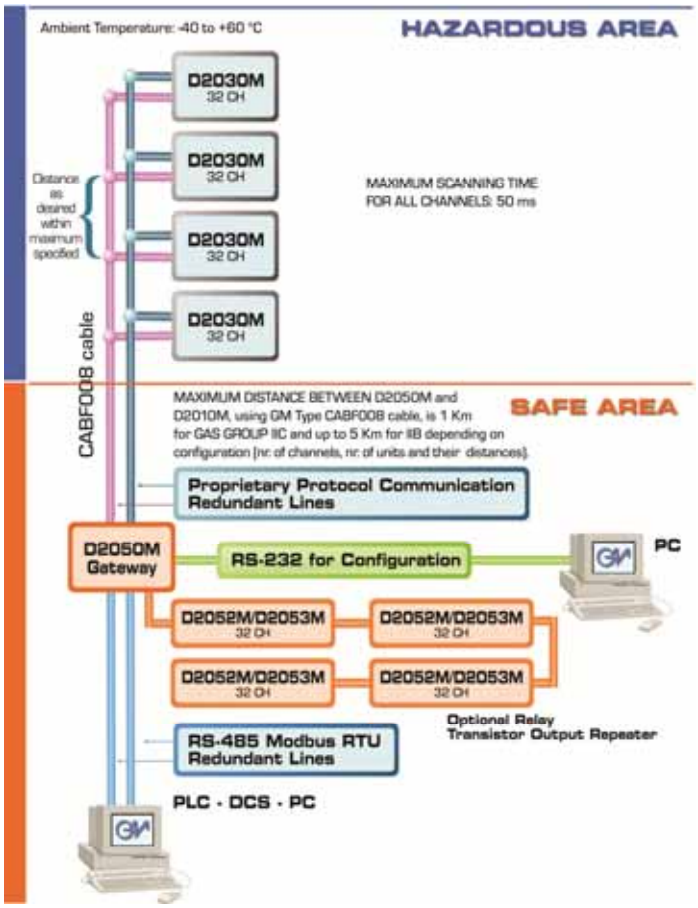


D2000M SERIES

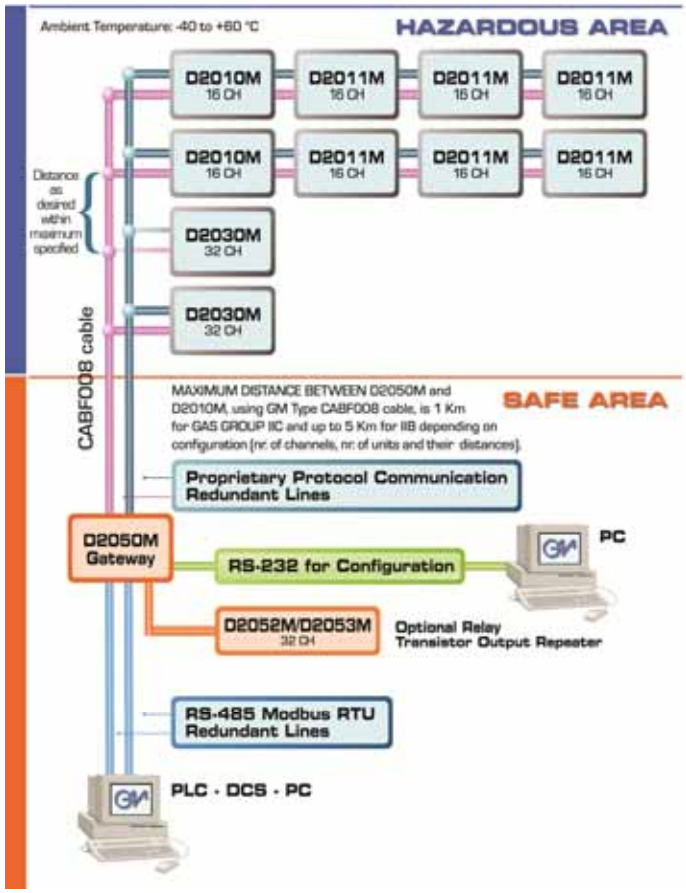
SYSTEM ARCHITECTURE

The **D2000M Multiplexer** accepts both analog and digital inputs in the same system allowing the user to choose whatever configuration fits his application best in terms of cost and cabling.

The following are two examples of achievable system architectures.



128 Digital Inputs from 4 D2030M slave units in the field and 128 Digital Outputs in Safe Area through repeaters D2052M or D2053M.



128 Analog and 64 Digital Inputs. One of the two D2030M digital units is repeated in safe area through the D2052M or D2053M.

MULTIPLEXING TECHNIQUE



Signal Data Acquisition

In industrial processes it is a common need to acquire a relevant number of temperatures, pressures, flows, levels and other process variables as well as the status of switches or proximitors and to collect all these data in a single remote collection area (i.e. in a control room) where a PLC (Programmable Logic Controller) or a Process Computer collect all data and use them for monitoring purposes or make them available to the operators.

SCADA (Signal Conditioning And Data Acquisition) equipments are particularly suited for this purpose. Modern micro electronics permits fast, accurate and stable Analog to Digital conversion, high speed computing, sophisticated intelligence and powerful measuring capabilities.

All this performance can be packed into compact, reliable units that can operate in harsh environments.

Multiplexers are a typical SCADA multi channel equipment that can be located in the field close to the process area where the input channels can be connected with shorter lines.

All input channel signals are converted in a numeric form and transmitted to a remote location via a single or redundant communication line.



The advantages of multiplexing

When a consistent quantity of variables must be made available to a distant location, instead of wiring each process variable signal with long individual connection lines up to the control room, it is advantageous to connect all input signals to a conveniently located field Multiplexer with short connections lines to the sensors. Data is then sent through a single communication line to the remote monitoring area. Even when space for cables is available the saving in cable costs alone justifies, most of the times, a multiplexer solution; in addition, a tidy simple connection is obtained avoiding cluttering of wires in the control room area.

Multiplexing in Hazardous Area

For applications in classified Hazardous Areas each signal must be protected from the risk of causing an ignition of flammable mixtures: this requires a safety barrier for each input channel.

By using an Intrinsically Safe certified multiplexer solution, protection must be applied only to the communication lines, decreasing complexity, maintenance and costs.

When multiplexing is the only viable solution

In case of revamping or adding of new parts in the plant, the space for adding cables may be limited or the few existing spare cables may be the only ones that can be used. Radio Frequency links, beside cost and licensing problems, suffer data security and reliability issues.

Multiplexing often becomes the only practical solution.

D2000M

D2000M SERIES - SELECTION TABLE / ACCESSORIES

INTRINSICALLY SAFE FIELD MULTIPLEXER

Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply
	**D2010M**	Universal TC, 3/4-Wires RTD, mV	D2050M Gateway via redundant communication line, up to 5 Km away	16	Supplied by D2050M
	**D2011M**	Universal TC, 3/4-Wires RTD, mV Connected to D2010M		16	
	**D2030M**	Voltage free contacts, proximity switches		32	
	**D2050M**	Up to 4 units D2010M, D2030M.	RS-485 MODBUS, RS-232 Serial line	-	20-30 Vdc
	**D2052M**	Digital signals from D2030M	Relay, digital repeater	32	20-30 Vdc
	**D2053M**		O.C. Transistor, digital repeater	32	20-30 Vdc

Configurable via Software SWC2090 or MODBUS protocol (see instruction manual ISM0078)

ACCESSORIES

Image	Code	Description
	**D1090Q** **D1094Q**	4 channels shunt module for mA input 4 channels shunt module for V input
	**OPT2091**	Cold Junction compensator for TC input
	**MOR016**	DIN-Rail Stopper
	**MOR045**	Double terminal block for field cable CABF008
	**CABF005** **CABF006** **CABF007**	Flat cable to interconnect D2010M with expander units D2011M Available in 15, 30, 50cm lengths.
	**CABF022** **CABF023** **CABF024**	Flat cable to interconnect D2050M with repeater units D2052M/D2053M Available in 15, 30, 50cm lengths.
	**CABF008**	Cable to interconnect D2050M with field units D2010M and D2030M



POWER SUPPLY SERIES

Intrinsically Safe and Non-Incendive power supplies



Power

PSD1000

UNIVERSAL INPUT POWER SUPPLY FOR D1000 SERIES ISOLATORS (PS)

- Supply 90 - 265 Vac
- Output 24 Vdc, 500 mA
- 2 Units can be paralleled for Redundancy or additional power
- Remote indication for Power Failure
- Installation next to D1000 Series Modules, without Safety distance of 50 mm, because Supply and Output Terminal Blocks are on the same side
- Zone 2 / Div. 2 installation

PSD1001C

SIL 2 1 CHANNEL INTRINSICALLY SAFE POWER SUPPLY (PS)

- II (1) G D [EEx ia] IIB; I M2 [EEx ia]
- 1 Output 13.5 V - 100 mA or 10 V - 150 mA
- Input from Zone 0 / Div. 1
- Zone 2 / Div. 2 installation



PSD1001 Quad Channel P.S.



PSU1003 PCB Module

PSD1001

SIL 2 4 CHANNELS INTRINSICALLY SAFE POWER SUPPLY (PS)

- II (1) G D [EEx ia] IIC; I M2 [EEx ia]
- 4 Independent Outputs 15 V, 20 mA
- Input from Zone 0 / Div. 1
- Zone 2 / Div. 2 installation
- Flexible modular multiple output capability.
- Output short circuit proof and current limited.
- High Reliability, SMD components.
- High Density, four channels per unit.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.

PSD1004

INTRINSICALLY SAFE POWER SUPPLY (PS)

- II 1 G EEx ia IIB T4
- Output 5 Vdc, 160 mA
- Supplied by PSD1001C
- Zone 0 Installation
- 500 V input/output isolation

PSU1003

1 CHANNEL INTRINSICALLY SAFE POWER SUPPLY PCB MODULE (PS)

- II 1 G EEx ia IIB T4
- Output 5 Vdc, 160 mA, supplied by PSD1001C
- Zone 0 Installation
- Module for PCB Mounting
- 500 V input/output isolation
- Width 55 mm, Depth 30 mm, Height 15 mm

PSD1000

PSD1210 (PSD1206)

PSD1200

SIL 2 - SIL 3 NON/INCENDIVE POWER SUPPLY (PS)

- II 3 G EEx nA IIC T4
- Output: 24 V, 10 A (6 A), 250 W (150 W)
- Line and Load Regulation 0.2 %
- Supply 95 to 264 Vac
- Power Factor Correction 0.95
- Parallel operation for Redundancy with integrated load sharing capability
- Redundant crowbars for overvoltage protection
- SPST O.C. Alarm transistor to signal all fault conditions
- Zone 2 / Div. 2 installation
- 24 Vdc output Short-circuit proof: in case of short-circuit a high current pulse guarantees immediate fuse interruption without disturbing normal operation
- External terminal block for quick T-proof testing



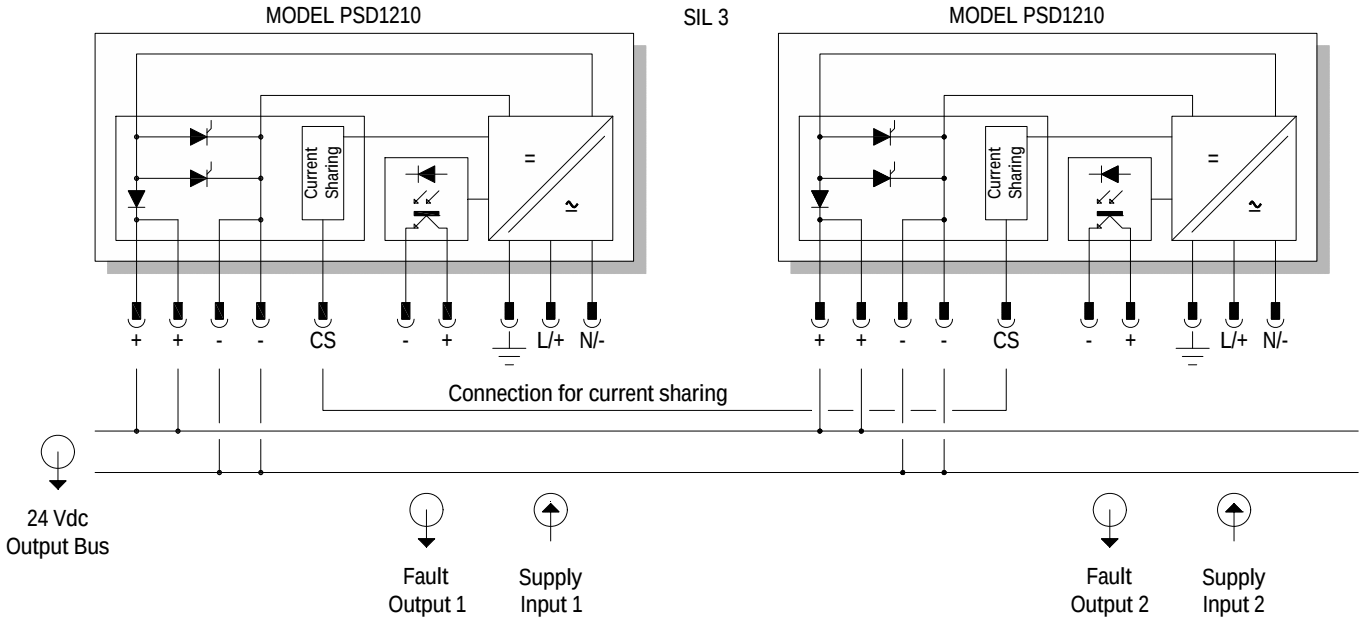
PSD1210 Front



PSD1210 Rear

FUNCTION DIAGRAM

PSD1200 units can be paralleled for **redundancy** operation to increase availability upgrading the system from SIL 2 to SIL 3 (N+1) or to increase output power. Internal power diodes for parallel operation prevent fault propagation in parallel connected supply systems and **load sharing** distributes current load equally to each power supply to increase reliability and reduce internal power dissipation.



	Field device	Model	Hazardous Area	Safe Area	Ch. per unit	Supply	SIL level
POWER SUPPLIES		**PSD1000**	Installation in Safe Area or Zone 2 / Div. 2	24 V, 500 mA to power D1000 Series Modules	1	95-264 Vac 115-350 Vdc	-
		**PSD1001**	15 V, 20 mA 3-Wires Tx or other devices	24 Vdc	4	21.5-30 Vdc	SIL 2 Bus powered or SIL 3 Loop powered
		**PSD 1001C**	13.5 V, 100 mA 3-Wires Tx or other devices	24 Vdc	1		
		**PSU1003**	5 V, 160 mA	PCB Mounting	1	via PSD1001C	-
		**PSD1004**		DIN-Rail mounting	1		-
		**PSD1210**	Installation in Safe Area or Zone 2 / Div. 2	24 V, 10 A, 250 W	1	95-264 Vac 115-350 Vdc	SIL 3 (N+1)

Power



FIELD DISPLAY SERIES

4 ½ Digit loop indicator

Installation in Zone 0



T3000

T3010 INDICATOR SERIES

- II (1) G [Ex ia] IIC, II (1) D [Ex iaD], I (M2) [Ex ia] I, II 3G Ex nA IIC T4
- ATEX, FM & FM-C, Russian certifications
- Large LCD Display, 20 mm high
- Limited voltage drop (less than 1 V)
- IP66 Enclosure with 2 separated chambers
- Wall, Pipe-Post, or Panel mounting
- Zone 0 IIC T5 / T6 or Div. 1 Installation
- In-field configurability via dedicated push-buttons
  - decimal point
  - indicated range between -19999 and +19999
  - direct or reverse indication
- Under and Over range detection via blinking display
- Protected slot available for engineering value label



Horizontal 2” pipe mounting



Panel mounting

FUNCTION DIAGRAM

T3010S units can be connected in series to a 4-20 mA loop (figure A) or can be driven from Safe Area to provide local indication in Hazardous Areas up to Zone 0 / Div. 1 (figure B).

In both cases the unit must be protected by a suitable intrinsically safe barrier.

Please check data sheet for further information.

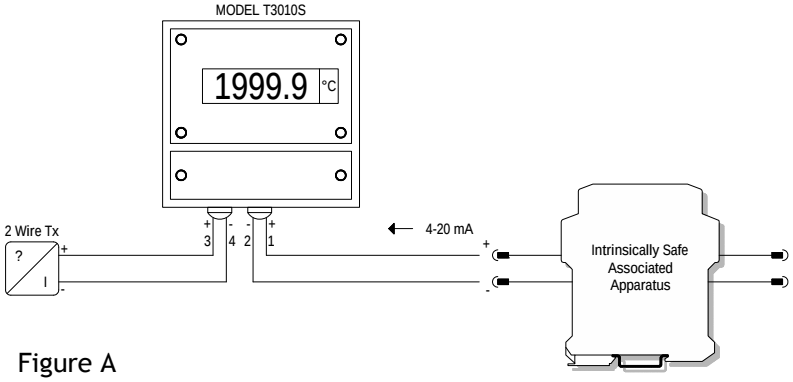


Figure A

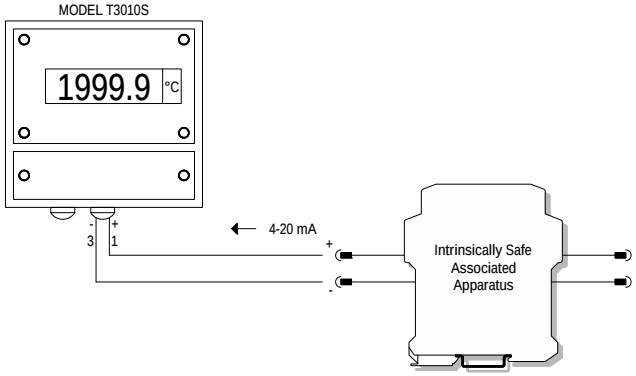


Figure B

4.5 DIGIT LOOP POWERED INDICATOR

The T3010S provides process variable reading in Hazardous Area.
It is a loop powered 4-20 mA unit with less than 1 V voltage drop and monitors 4-20 mA current, 0-100 % percentage or process variables between -19999 to +19999 range with a 20 mm height 7-segments LCD display.
Blinking display indicates over range or under range condition.

An internal protected slot-in label is provided, after the last digit, to allow the unit measurement indication.
Loop tag indication can be also provided.

The indicator is housed in a molded reinforced polyamide 66 / polycarbonate IP 66 case to allow installation in field area. It can be mounted on flat surface, front panel or 2" pipe or post. The housing is divided in two parts, one for cable connection and the other for indicator parameters setting.



Removable covers for easy access



Vertical 2" pipe mounting

TECHNICAL DATA

Input Range: 4 to 20 mA nominal (3 to 22 mA reading).
Voltage drop: ≤ 1.0 V, loop powered.
Over range protection: ≤ 200 mA without damage.
Visualization:
4 ½ digit, 20 mm height, 7 segments LCD display.
Range indication: -19999 to +19999.
Decimal point: any position or disabled.
Setting: any value within range, direct or reverse indication.
Out of range indication: ≤ 3.5 mA or ≥ 20.5 mA blinking display.
Engineering value: internal slot-in label.
Reading rate: 2 measures per second.
Performance:
Ref. conditions 4-20 mA range, 23 ± 1 °C ambient temp.
Calibration accuracy: ≤ ± 5 digit.
Linearity error: ≤ ± 3 digit.
Series mode rejection:
≤ ± 1 digit for 1 mA peak-peak 50 Hz signal.
Temperature influence: ≤ ± 0.2 digit for a 1 °C change.
Compatibility: CE mark compliant, conforms to 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.

MOUNTING OPTIONS









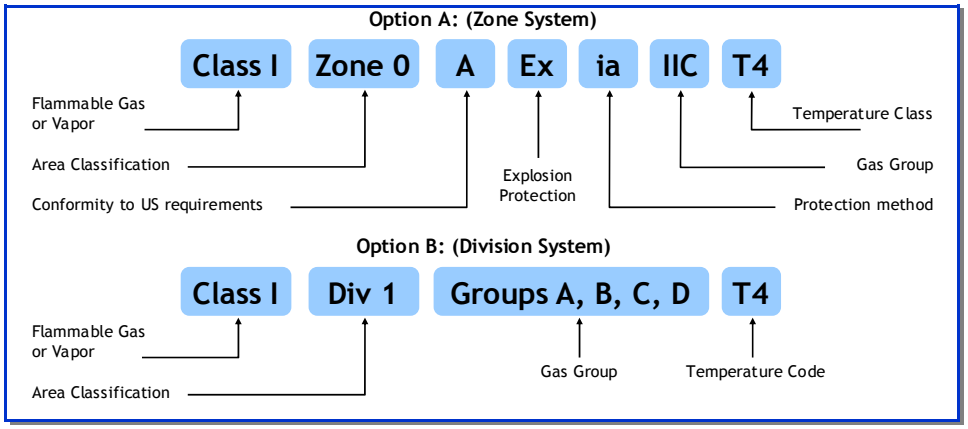




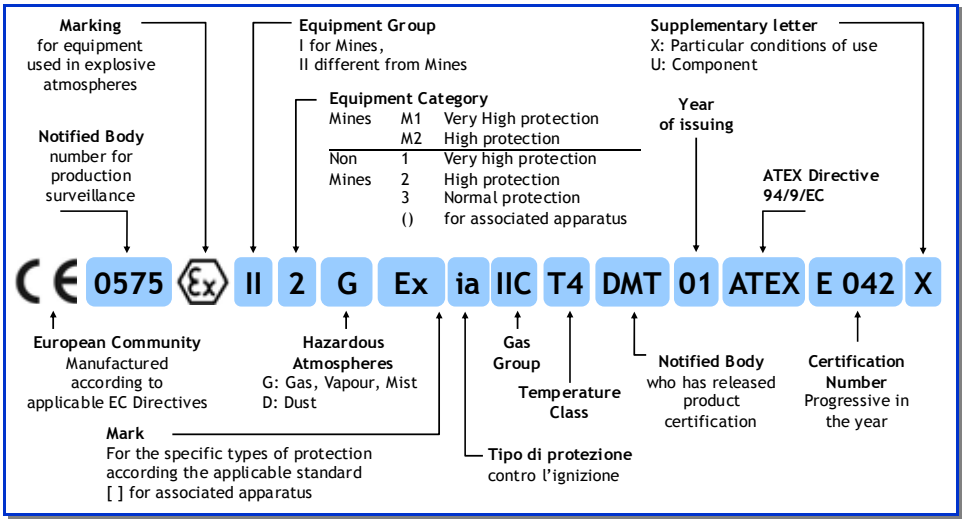
INTRINSIC SAFETY

BRINGING INSTRUMENTATION INTO HAZARDOUS AREAS

MARKING FOR NORTH AMERICA ACCORDING NEC / CEC



MARKING ACCORDING ATEX DIRECTIVE 94/9/EC



ELECTRICAL APPARATUS FOR EXPLOSIVE ATMOSPHERES / CATEGORY 1 AND 2 APPARATUS GAS

Type of protection	Code	IEC /CENELEC standard	US Division Standard	US Zone Standard	Canadian Div. Standard	Canadian Zone Standard
General requirements	-	60079-0	FM3600	UL60079-0	C22.2 No. 0	E60079-0
Intrinsic Safety	Ex ia; ib	60079-11	FM3610/UL913	UL60079-11	C22.2 No. 157	E60079-11
Increased Safety	Ex e	60079-7	-	UL60079-7	-	E60079-7
Flameproof / Expl. Proof	Ex d	60079-1	FM3615/UL1203	UL60079-1	C22.2 No. 30	E60079-1
Pressurization	Ex p	60079-2	NFPA 496	-	CSA TIL 13A	-
Powder filling	Ex q	60079-5	-	UL60079-5	-	E60079-5
Encapsulation	Ex m	60079-18	-	UL60079-18	-	E60079-18
Oil immersion	Ex o	60079-6	-	UL60079-6	-	E60079-6
Type n	Ex n	60079-15	FM3611/UL1604	UL60079-15	C22.2 No. 213	E60079-15
Intrinsically safe systems	Ex ia; ib	60079-25	-	-	-	-
Special requirements	-	60079-26	-	-	-	-

CATEGORY 3 GAS

Type n equipment containing:	Additional code letter
Enclosed break device	C
Non incendive component	C
Hermetically sealed device	C
Sealed device	C
Encapsulated device	C
Energy limited apparatus	L
Restricted breathing enclosure	R
Simplified pressurization	P
Non sparking	A

GAS / DUST GROUPING

Reference Gas / Dust	North America	ATEX
Acetylene	Class I, Group A	Group IIC
Hydrogen	Class I, Group B	Group IIC
Ethylene	Class I, Group C	Group IIB
Propane	Class I, Group D	Group IIA
Methane	Gaseous Mines	Group I
Magnesium	Class II, Group E	-
Coal	Class II, Group F	-
Grain	Class II, Group G	-
Cotton	Class III	-



I.S. Basic Principles

The basic principle, on which intrinsic safety works, is to limit, under normal conditions, the amount of electrical energy in Hazardous Area circuits such that any sparks or arcs or high surface temperatures cannot ignite the explosive atmosphere.

Electrical equipment, in Hazardous Area, as well as the interconnected instrumentation in Safe Area, must be designed to reduce the open circuit voltage (Voc) and short circuit current (Isc) to values that cannot cause ignition by opening, closing or earthing the circuit or by heating of any parts belonging to the circuit.

Ignition Triangle

From a chemical point of view, oxidation, combustion and explosion are all exothermic reactions with different reaction speeds. For such reactions to take place, it is essential that the following three components be present simultaneously in due proportions: Fuel, Oxidizer, Energy

ELECTRICAL APPARATUS FOR INTRINSICALLY

Field Equipment:

SIMPLE APPARATUS:
Less than 1.5 V; 0.1 A; 20 µJ; 25 mW.
Certification not required
(TC, RTD, Pot, Switch, LED ..)

INTRINSICALLY SAFE APPARATUS:
Require certification.
(TX, I/P, Solenoid Valve, Prox., Field Display ..)
Safety Parameters to be matched by
Associated Apparatus:
Ui / Vmax (Max. Input Voltage);
Ii / Imax (Max. Input Current);
Ci (Internal Capacitance);
Li (Internal Inductance);
Pi (Max. Input Power).

Control Room Equipment:

ASSOCIATED APPARATUS:
Requires certification.
(Galvanic Isolators, Barriers, Signal Conditioners)
Safety Parameters to be matched with
Intrinsically Safe Apparatus:
Uo / Voc (Open Circuit Voltage);
Io / Isc (Short Circuit Current);
Co / Ca (Allowed Capacitance);
Lo / La (Allowed Inductance);
Po (Max. Power).

NON INTRINSICALLY SAFE APPARATUS:
All Apparatuses without Approval
(PLC, DCS, Computers, Controllers ..)

DIRECTIVE 94/9/EC - EQUIPMENT AND PROTECTIVE SYSTEMS

Group	Substance	Potentially Explosive Atmosphere	Protection Level	Fault or Protection Mode	Category	Zone
I Mines and surface installation	Methane Grisou and coal dusts	Present	Very High	2 independent faults or 2 protection modes	M1	-
		Probably present	High	1 fault or 1 protection mode	M2	-
II Surface industries and other sites	Gas, vapors, Fogs or Powder	Continuously present, or for long periods	Very High	2 independent faults or 2 protection modes	1	Zone 0 (G) Zone 20 (D)
		Probably present during normal operation.	High	1 fault or 1 protection mode	2	Zone 1 (G) Zone 21 (D)
		Occasionally present for short periods only	Normal	No fault during normal operation	3	Zone 2 (G) Zone 22 (D)



DIVISIONS / ZONES

Area Classification	North America	ATEX
Continuous Hazard	Div. 1 or Zone 0	Div. 1 or Zone 0
Intermittent Hazard	Div. 1 or Zone 1	Div. 1 or Zone 1
Abnormal Conditions Hazard	Div. 2 or Zone 2	Div. 2 or Zone 2

TEMPERATURE CODE / CLASS

Max surface Temperature (°C)	Code / Class	
	North America	ATEX
450	T1	T1
300	T2	T2
280	T2A	-
260	T2B	-
230	T2C	-
215	T2D	-
200	T3	T3
180	T3A	-
165	T3B	-
160	T3C	-
135	T4	T4
120	T4A	-
100	T5	T5
85	T6	T6

Ignition Energy



Oxidizer **Fuel**

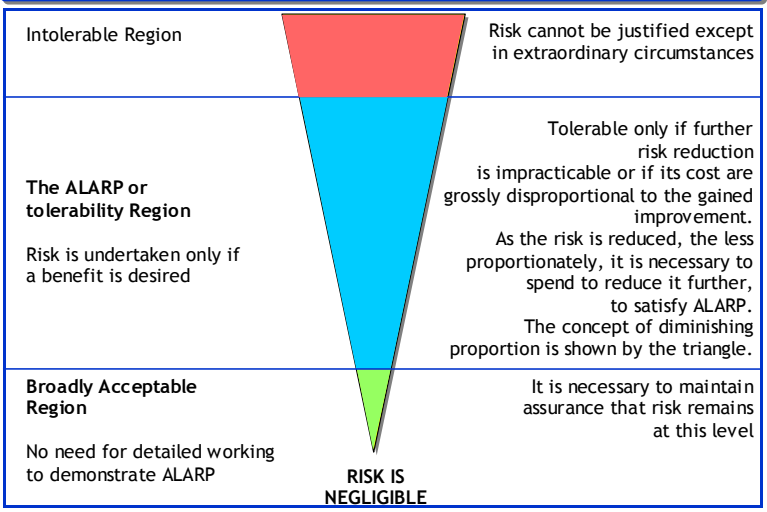
ATEX ZONES AND CATEGORIES

Level of protection			Equipment Category Directive 94/9/EC	Area classification Directive 1999/92/EC
Gas	Dust	Definitions / Locations	ATEX	Typical Zone Suitability
EN 60079-10 0	EN 61241-10 20	Very High: two independent means of protection or one protection allowing two independent faults. Place in which an explosive atmosphere is frequently or for long periods or continuously present.	High probability of Explosive Atmosphere 1G/1D/M1	Equipment for Zone 0, Zone 20
1	21	High: single mean of protection allowing only one fault. A place in which an explosive atmosphere is occasionally present during normal operation.	Possibility of Explosive Atmosphere 2G/2D/M2	Equipment for Zone 1, Zone 21
2	22	Normal: safe during normal operation. A place in which an explosive atmosphere is not present during normal operation, and eventually for short periods.	Low probability of Explosive Atmosphere 3G/3D	Equipment for Zone 2, Zone 22

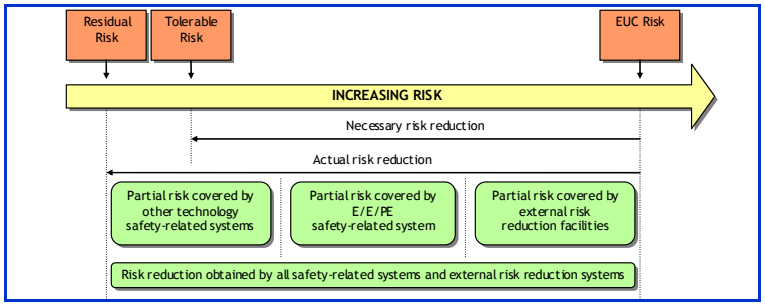
SIL LEVELS ACCORDING IEC 61508 / IEC 61511

SIL Safety Integrity Level	PFDavg Average probability of failure on demand per year (low demand)	RRF Risk Reduction Factor	PFDavg Average probability of failure on demand per hour (high demand)
SIL 4	$\geq 10^{-5}$ and $< 10^{-4}$	100000 to 10000	$\geq 10^{-9}$ and $< 10^{-8}$
SIL 3	$\geq 10^{-4}$ and $< 10^{-3}$	10000 to 1000	$\geq 10^{-8}$ and $< 10^{-7}$
SIL 2	$\geq 10^{-3}$ and $< 10^{-2}$	1000 to 100	$\geq 10^{-7}$ and $< 10^{-6}$
SIL 1	$\geq 10^{-2}$ and $< 10^{-1}$	100 to 10	$\geq 10^{-6}$ and $< 10^{-5}$

TOLERABLE RISKS AND ALARP (ANNEX 'B')



RISK REDUCTION



AVERAGE PROBABILITY OF FAILURE ON DEMAND (PFDAVG)

$$\frac{\text{Tolerable accident frequency}}{\text{Frequency of accidents without protections}} = \frac{1}{RRF}$$

PFDavg	Simplified equations	
	Without common causes	With common causes (Beta factor)
1oo1	$\lambda_{DU} \times \frac{TI}{2}$	-
1oo2 1oo2D	$\lambda_{DU_1} \times \lambda_{DU_2} \times \frac{TI^2}{3}$	$\frac{[(1-\beta)\times(\lambda_{DU}\times TI)]^2}{3} + \frac{(\beta\times\lambda_{DU}\times TI)}{2}$
1oo3	$\lambda_{DU_1} \times \lambda_{DU_2} \times \lambda_{DU_3} \times \frac{TI^3}{4}$	$\frac{[(1-\beta)\times(\lambda_{DU}\times TI)]^3}{4} + \frac{(\beta\times\lambda_{DU}\times TI)}{2}$
2oo2	$(\lambda_{DU_1} + \lambda_{DU_2}) \times \frac{TI}{2}$	$[(1-\beta)\times(\lambda_{DU}\times TI)] + \frac{(\beta\times\lambda_{DU}\times TI)}{2}$
2oo3	$\left[(\lambda_{DU_1}\times\lambda_{DU_2}) + (\lambda_{DU_1}\times\lambda_{DU_3}) + (\lambda_{DU_2}\times\lambda_{DU_3})\right] \times \frac{TI^2}{3}$	$[(1-\beta)\times(\lambda_{DU}\times TI)]^2 + \frac{(\beta\times\lambda_{DU}\times TI)}{2}$
1oo1 ($E_t \neq 100\%$)	$\lambda_{DU}\left[\left(Et\times\frac{TI}{2}\right) + (1-Et)\frac{SL}{2}\right]$	TI: Proof Test time interval Et: Test Effectiveness λ_{DU}: dangerous undetected failures

IEC 61508-61511

FACTS AND FORMULAE

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 benefits of these new standards include details and a greater effectiveness for what concerns:

- the definition of risk reduction and related requirements;
- system design and implementation;
- documentation management;
- safety assessment and validation;
- plant maintenance;
- cost management.

The majority of our products are SIL 3 or SIL 2 certified.

Safety Instrumented Systems



The experience in safety and electronics acquired during the years has lead us to the writing of a comprehensive manual on IEC61508 and IEC 61511. This effort has already proven to be a great benefit for engineers, maintenance personnel and whoever wishes to approach the concept of functional safety.
The manual is available on request in English, Spanish and Italian language.

SAFETY:

FREEDOM FROM UNACCEPTABLE RISK



Boiling Liquid expanding Vapor Explosion (BLEVE)



Flash Fire



Jet Fire



Pool Fire



Fireball

AVAILABILITY AND RELIABILITY

Basic Concepts:

Failure Rate :

$$\lambda = \frac{\text{Failures per unit time}}{\text{Components exposed to functional failure}}$$

$1\ \text{FIT} = 1 \times 10^{-9}$ Failures per hour

$\text{MTBF} = \text{MTTF} + \text{MTTR}$

$\mu = \frac{1}{\text{MTTR}}$

$\text{MTTF} = \text{MTBF} - \text{MTTR} = \frac{1}{\lambda}$

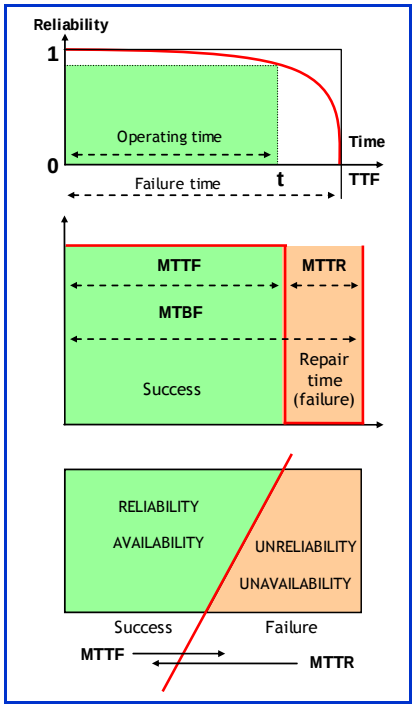
$\lambda = \frac{1}{\text{MTTF}}$

$$\text{Availability} = \frac{\text{Operating Time}}{\text{Operating Time} + \text{Repair Time}} = \frac{\text{MTTF}}{\text{MTTF} + \text{MTTR}} = \frac{\text{MTTF}}{\text{MTBF}} = \frac{\mu}{\mu + \lambda} = \frac{\text{MTBM}}{\text{MTBM} + \text{MSD}}$$

$$\text{Unavailability} = 1 - \text{Availability} = \frac{\lambda}{\mu}$$

Acronyms:

MTBF: Mean Time Between Failures
MTTF: Mean Time To Failure
MTTR: Mean Time To Repair
MTBM: Mean Time Between Maintenance
MSD: Expected Mean System Downtime
λ: Failure rate
μ: Repair rate



SAFE FAILURE FRACTION (SFF) AND SIL LEVELS

$$\text{SFF} = \frac{\sum \lambda_{DD} + \sum \lambda_{SD} + \sum \lambda_{SU}}{\sum \lambda_{DD} + \sum \lambda_{DU} + \sum \lambda_{SD} + \sum \lambda_{SU}} = 1 - \frac{\sum \lambda_{DU}}{\sum \lambda_{TOT}}$$

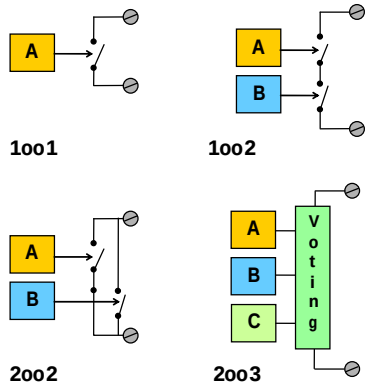
	Hardware fault tolerance 0	Hardware fault tolerance 1	Hardware fault tolerance 2
TYPE A Components			
< 60%	SIL 1	SIL 2	SIL3
60% - < 90%	SIL 2	SIL 3	SIL 4
90% - < 99%	SIL 3	SIL 4	SIL 4
> 99%	SIL 3	SIL 4	SIL 4
TYPE B Components			
< 60%	Not allowed	SIL 1	SIL2
60% - < 90%	SIL 1	SIL 2	SIL 3
90% - < 99%	SIL 2	SIL 3	SIL 4
> 99%	SIL 3	SIL 4	SIL 4

Failure rates categories: λ_{DD}: dangerous detected; λ_{DU}: dangerous undetected
λ_{SD}: safe detected; λ_{SU}: safe undetected

MEAN TIME TO FAILURE SPURIOUS

MTTFs	
1oo1	$\frac{1}{\lambda_S}$
1oo2	$\frac{1}{2\lambda_S}$
2oo2	$\frac{1}{2\lambda_S^2 \times \text{MTTR}}$
2oo3	$\frac{1}{6\lambda_S^2 \times \text{MTTR}}$

SYSTEM ARCHITECTURES





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