INSTRUCTION MANUAL

Load Cell/Strain Gauge Bridge
Isolating Repeater
Din-Rail Model D1063S

Characteristics

General Description: The single channel DIN Rail Load Cell/Strain Gauge Bridge Isolating Repeater D1063S acts as a transparent galvanic isolated interface installed between a weighing indicator in Safe Area and a load cell (or group of load cells) in Hazardous Area; it appears at the terminals of the indicator as a single load cell equivalent to the one in the field. Provides a fully floating power supply voltage with remote sensing capability to load cell located in Hazardous Area and repeats, while isolating, the mV signal output to drive a load in Safe Area depending on the host system reference voltage. Up to four 350 Ω load cells, or six 450 Ω load cells, or twelve 1000 Ω load cells can be connected in parallel. Voltage reference (Safe Area side) is DIP switch configurable to select internal or external (host system) supply.
In addition a field wiring fault red LED indicates any wire break in the Hazardous Area side.
Function: 1 channel I.S. input from strain gauge signals, provides 3 port isolation (input/output/supply) and repeats, as a transparent unit, bridge signal output.
Signalling LEDs: Power supply indication (green), field wiring fault (red).
Field Configurability: Voltage reference internal or external via DIP switch.
EMC: Fully compliant with CE marking applicable requirements.

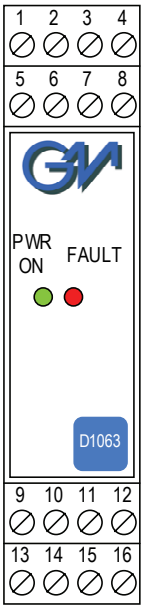
Technical Data

Supply: 24 Vdc nom (20 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
Current consumption @ 24 V: 80 mA with four 350 Ω load cells connected, typical.
Power dissipation: 1.7 W with 24 V supply and four 350 Ω load cells connected typical.
Max. power consumption: at 30 V supply voltage and short circuit input, 2.8 W.
Isolation (Test Voltage): I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV; Out/Supply 500 V.
Input: up to four 350 Ω load cells in parallel or up to six 450 Ω load cells in parallel or up to twelve 1000 Ω load cells in parallel.
Bridge supply voltage: 4.5 V nominal.
Bridge output signal: ≤ 2 mV/V.
Input range: ± 9 mV nominal span, ± 11 mV overrange.
Line resistance compensation: ≤ 10 Ω.
Burnout: LED indication for field wire breakage.
Output: ± 10 mV nominal span, ± 12 mV overrange (5 V reference voltage), ± 20 mV nominal span, ± 24 mV overrange (10 V reference voltage).
Output impedance: 350 Ω typical.
Host reference voltage: ≤ 10 V typical, ≤ 11 V maximum.
Internal reference voltage: 10 V typical, DIP switch settable.
Internal impedance: 350 Ω typical, DIP switch settable.
Transfer characteristic: linear based on mV input.
Response time: ≤ 100 ms (10 to 90 % step change).
Performance: Ref. Conditions 24 V supply, 23 ± 1 °C ambient temperature.
Calibration accuracy after system calibration: ≤ ± 0.003 % of full scale of input range.
Linearity accuracy: ≤ ± 0.002 % of full scale of input range.
Supply voltage influence: ≤ ± 0.002 % of full scale for a min to max supply change.
Temperature influence: ≤ ± 0.002 % of full scale of input range for a 1 °C change.
Compatibility:
CE mark compliant, conforms to 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.
Environmental conditions: ***Operating:*** temperature limits -20 to + 60 °C, relative humidity max 90 % non condensing, up to 35 °C.
Storage: temperature limits – 45 to + 80 °C.
Safety Description:
II (1) GD [EEx ia] IIC, I (M2) [EEx ia] I, II 3G Ex nA II T4, [Ex ia] IIC associated electrical apparatus.
Uo/Voc = 17.3 V, Io/Isc = 199.6 mA, Po/Po = 864 mW at terminals 9-10-11-12-13-14.
Uo/Voc = 17.3 V, Io/Isc = 8 mA, Po/Po = 35 mW at terminals 13-14.
Ui/Vmax = 30 V, Ci = 0 nF, Li = 0 nH at terminals 13-14.
Um = 250 Vrms, -20 °C ≤ Ta ≤ 60 °C.
Approvals:
DNV-2004-OSL-ATEX-0199 conforms to EN50014, EN50020, EN50284, IECEx DNV 07.0001 conforms to IEC60079-0, IEC60079-11,
IMQ 09 ATEX 013 X conforms to EN60079-0, EN60079-15,
FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810 and C22.2 No.142, C22.2 No.157, C22.2 No.213, E60079-0, E60079-11, E60079-15,
Russia according to GOST 12.2.007.0-75, R 51330.0-99, R 51330.10-99 [Exia] IIC X,
DNV and KR Type Approval Certificate for marine applications.
Mounting: T35 DIN Rail according to EN50022.
Weight: about 165 g.
Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm^2.
Location: Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4, Class I, Division 2, Groups A, B, C, D Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA T4 installation.
Protection class: IP 20.
Dimensions: Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

Ordering information

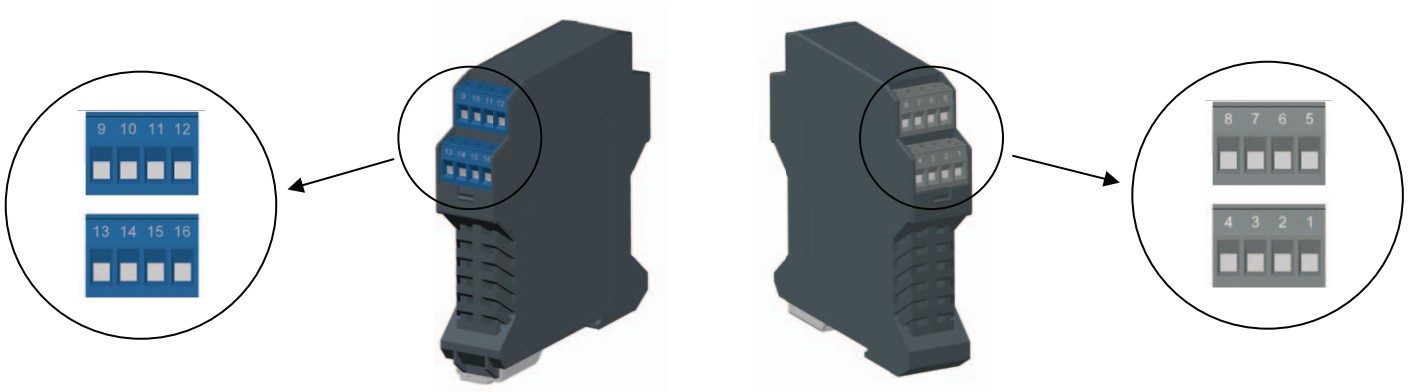
Model:	D1063S	
Power Bus enclosure		/B

Front Panel and Features



- Input from Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- Strain Gauge Bridge Transparent Repeater.
- Up to four 350 Ω load cells in parallel or up to six 450 Ω load cells in parallel or up to twelve 1000 Ω load cells in parallel.
- Broken field wire fault detection.
- High Accuracy.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- In-field programmability by DIP switch.
- ATEX, IECEx, FM & FM-C, Russian Certifications.
- Type Approval Certificate DNV and KR for marine applications.
- High Reliability, SMD components.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.
- 250 Vrms (Um) max. voltage allowed to the instruments associated with the barrier.

Terminal block connections



HAZARDOUS AREA	
9	+ Input Ch 1 EXC (Load cell)
10	+ Input Ch 1 Sense (Load cell)
11	- Input Ch 1 Sense (Load cell)
12	- Input Ch 1 EXC (Load cell)
13	+ Input Ch 1 IN (Load cell)
14	- Input Ch 1 IN (Load cell)
15	Not used
16	Not used

SAFE AREA	
1	+ Output Ch 1 IN (Weighing Indicator) or + Output for mV Source mode
2	- Output Ch 1 IN (Weighing Indicator) or - Output for mV Source mode
3	+ Power Supply 24 Vdc
4	- Power Supply 24 Vdc
5	+ Output Ch 1 EXC (Weighing Indicator)
6	+ Output Ch 1 Sense (Weighing Indicator)
7	- Output Ch 1 Sense (Weighing Indicator)
8	- Output Ch 1 EXC (Weighing Indicator)

Parameters Table

In the system safety analysis, always check the Hazardous Area/Hazardous Locations devices to conform with the related system documentation, if the device is Intrinsically Safe check its suitability for the Hazardous Area/Hazardous Locations and gas group encountered and that its maximum allowable voltage, current, power (Ui/Vmax, Ii/Imax, Pi/Pi) are not exceeded by the safety parameters (Uo/Voc, Io/Isc, Po/Po) of the D1063 Associated Apparatus connected to it. Also consider the maximum operating temperature of the field device, check that added connecting cable and field device capacitance and inductance do not exceed the limits (Co/Ca, Lo/La, Lo/Ro) given in the Associated Apparatus parameters for the effective gas group. See parameters on enclosure side and the ones indicated in the table below:

D1063 Terminals		D1063 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations
Ch1	9 - 10 - 11 - 12 - 13 - 14	Uo / Voc = 17.3 V	≤	Ui / Vmax
Ch1	13 - 14	Uo / Voc = 17.3 V		
Ch1	9 - 10 - 11 - 12 - 13 - 14	Io / Isc = 199.6 mA	≤	Ii/ Imax
Ch1	13 - 14	Io / Isc = 8 mA		
Ch1	9 - 10 - 11 - 12 - 13 - 14	Po / Po = 864 mW	≤	Pi / Pi
Ch1	13 - 14	Po / Po = 35 mW		

D1063 Terminals		D1063 Associated Apparatus Parameters		Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
Ch1	9 - 10 - 11 - 12 - 13 - 14	Co / Ca = 351 nF Co / Ca = 2.058 µF Co / Ca = 8.498 µF	(IIC-A, B) (IIB-C) (IIA-D)	≥	Ci / Ci device + C cable
Ch1	13 - 14	Co / Ca = 353 nF Co / Ca = 2.06 µF Co / Ca = 8.5 µF	(IIC-A, B) (IIB-C) (IIA-D)		
Ch1	9 - 10 - 11 - 12 - 13 - 14	Lo / La = 0.85 mH Lo / La = 3.4 mH Lo / La = 6.8 mH	(IIC-A, B) (IIB-C) (IIA-D)	≥	Li / Li device + L cable
Ch1	13 - 14	Lo / La = 300 mH Lo / La = 1200 mH Lo / La = 2400 mH	(IIC-A, B) (IIB-C) (IIA-D)		
Ch1	9 - 10 - 11 - 12 - 13 - 14	Lo / Ro = 41.2 µH/Ω Lo / Ro = 164.8 µH/Ω Lo / Ro = 329.6 µH/Ω	(IIC-A, B) (IIB-C) (IIA-D)	≥	Li / Ri device and L cable / R cable
Ch1	13 - 14	Lo / Ro = 1020 µH/Ω Lo / Ro = 4110 µH/Ω Lo / Ro = 8220 µH/Ω	(IIC-A, B) (IIB-C) (IIA-D)		

NOTE for USA and Canada:
IIC equal to Gas Groups A, B, C, D, E, F and G; IIB equal to Gas Groups C, D, E, F and G; IIA equal to Gas Groups D, E, F and G

When used with separate powered intrinsically safe devices, check that maximum allowable voltage, current (Ui/Vmax) of the D1063 Associated Apparatus are not exceeded by the safety parameters (Uo/Voc) of the Intrinsically Safe device, indicated in the table below:

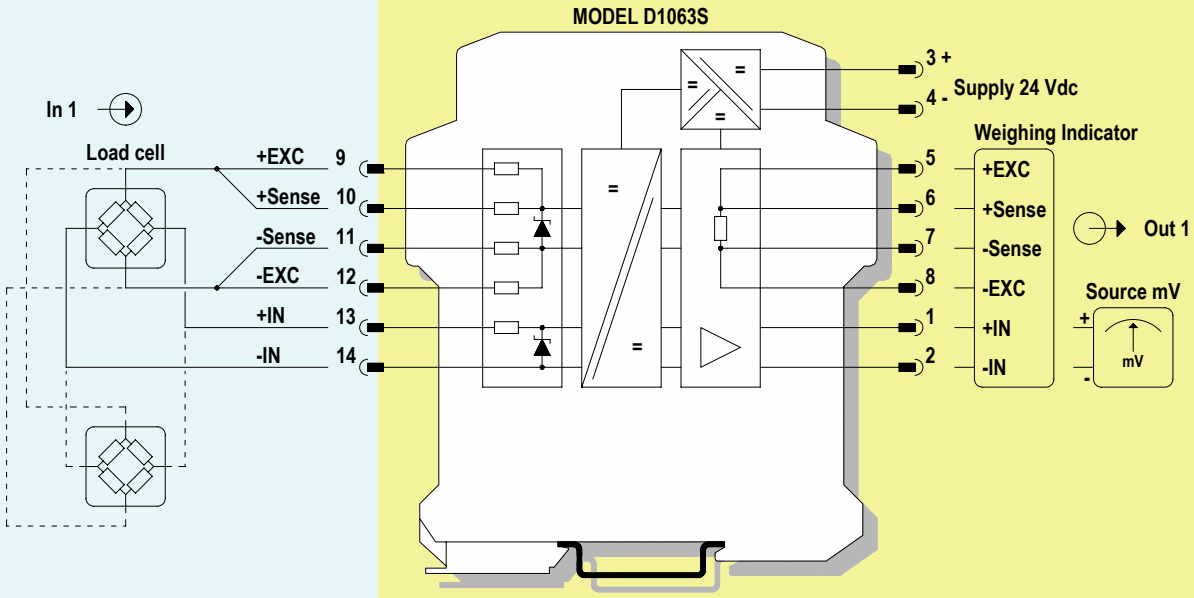
D1063 Terminals		D1063 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
Ch1	13 - 14	Ui / Vmax = 30V	≥	Uo / Voc
Ch1	13 - 14	Ci = 0 nF, Li= 0 nH		

For installations in which both the Ci and Li of the Intrinsically Safe apparatus exceed 1 % of the Co and Lo parameters of the Associated Apparatus (excluding the cable), then 50 % of Co and Lo parameters are applicable and shall not be exceeded (50 % of the Co and Lo become the limits which must include the cable such that Ci device + C cable ≤ 50 % of Co and Li device + L cable ≤ 50 % of Lo).
If the cable parameters are unknown, the following value may be used: Capacitance 60pF per foot (180pF per meter), Inductance 0.20µH per foot (0.60µH per meter).
The Intrinsic Safety Entity Concept allows the interconnection of Intrinsically Safe devices approved with entity parameters not specifically examined in combination as a system when the above conditions are respected.
For Division 1 and Zone 0 installations, the configuration of Intrinsically Safe Equipment must be FM approved under Entity Concept (or third party approved);
for Division 2 installations, the configuration of Intrinsically Safe Equipment must be FM approved under non-incendive field wiring or Entity Concept (or third party approved).

Function Diagram

HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

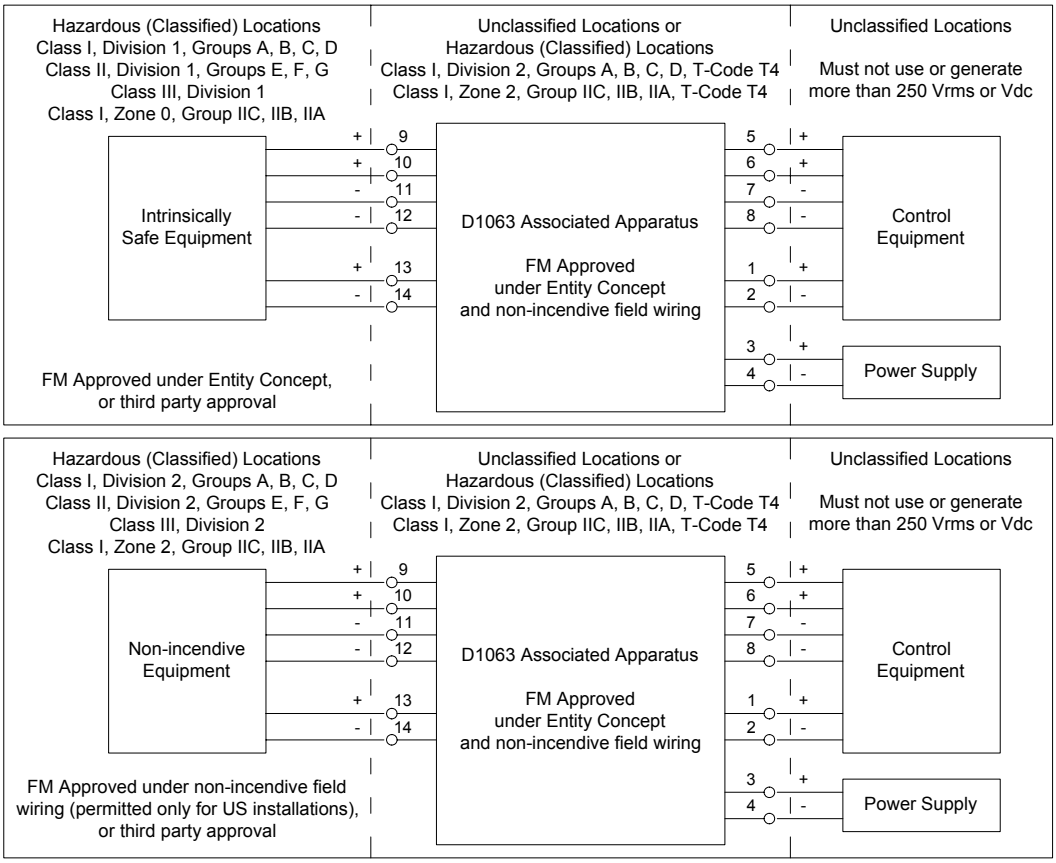
SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



Up to 4 load cells 350 Ω in parallel
Up to 6 load cells 450 Ω in parallel
Up to 12 load cells 1000 Ω in parallel

Warning

D1063 is an isolated Intrinsically Safe Associated Apparatus installed into standard EN50022 T35 DIN Rail located in Safe Area/ Non Hazardous Locations or Zone 2, Group IIC, Temperature Classification T4, Class I, Division 2, Groups A, B, C, D, Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA Temperature Code T4 Hazardous Area/Hazardous Locations (according to EN/IEC60079-15, FM Class No. 3611, CSA-C22.2 No. 213-M1987, CSA-E60079-15) within the specified operating temperature limits Tamb -20 to +60 °C, and connected to equipment with a maximum limit for AC power supply Um of 250 Vrms.



Non-incendive field wiring is not recognized by the Canadian Electrical Code, installation is permitted in the US only.
For installation of the unit in a Class I, Division 2 or Class I, Zone 2 location, the wiring between the control equipment and the D1063 associated apparatus shall be accomplished via conduit connections or another acceptable Division 2, Zone 2 wiring method according to the NEC and the CEC.
Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground.
D1063 must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC) following the established installation rules, particular care shall be given to segregation and clear identification of I.S. conductors from non I.S. ones.
De-energize power source (turn off power supply voltage) before plug or unplug the terminal blocks when installed in Hazardous Area/Hazardous Locations or unless area is known to be nonhazardous.
Warning: substitution of components may impair Intrinsic Safety and suitability for Division 2, Zone 2.
Explosion Hazard: to prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or unless area is known to be nonhazardous.
Failure to properly installation or use of the equipment may risk to damage the unit or severe personal injury.
The unit cannot be repaired by the end user and must be returned to the manufacturer or his authorized representative. Any unauthorized modification must be avoided.

Operation

D1063 strain gauge bridge isolating repeater acts as transparent galvanic isolated interface between weighing indicator in Safe Area/Non Hazardous Locations and a load cell (or group of n load cells) installed in Hazardous Area/Hazardous Locations.
It provides a fully floating power supply voltage with remote sensing capability to strain gauge bridge and repeats the corresponding output signal.
Remote sensing wires (terminals “10” +Sense and “11” –Sense) must be always connected to force lines (terminals “9” +Exc and “12” –Exc) for proper operation of the unit, in case of 4 wires cell connect the sensing lines near to the cell connections to minimize the power supply voltage compensation error.
The mV input signal is isolated and repeated to Safe Area/Non Hazardous Locations to drive a weighing indicator.
The unit appears at the terminals of the indicator as a single load cell equivalent to the one installed in the field area.
The mV output signal is proportional to the reference voltage of the host system or internal reference.
The reference voltage is dip-switch selectable for internal or external operation.
At the forcing lines of the indicator can also be connected via dip-switch a load simulating a cell.
A “POWER ON” green led lits when input power is present.
In addition a field wiring fault red LED indicates any wire break in the Hazardous Area/Hazardous Locations connections and forces the output signal in an over range condition.
Note that complete system calibration is necessary to obtain the correct value reading. Please follow the specific weighing indicator instructions manual to setup the system.

Installation

D1063 is a strain gauge bridge isolating repeater housed in a plastic enclosure suitable for installation on T35 DIN Rail according to EN50022.
D1063 unit can be mounted with any orientation over the entire ambient temperature range, see section “Installation in Cabinet” and "Installation of Electronic Equipments in Cabinet" Instruction Manual D1000 series for detailed instructions.
Electrical connection of conductors up to 2.5 mm² are accommodated by polarized plug-in removable screw terminal blocks which can be plugged in/out into a powered unit without suffering or causing any damage **(for Zone 2 or Division 2 installations check the area to be nonhazardous before servicing)**.
The wiring cables have to be proportionate in base to the current and the length of the cable.
On the section “Function Diagram” and enclosure side a block diagram identifies all connections and configuration DIP switches.
Identify the function and location of each connection terminal using the wiring diagram on the corresponding section, as an example:
Connect 24 Vdc power supply positive at terminal “3” and negative at terminal “4”.
Connect positive output at terminal “1” and negative output at “2”.
Connect host reference voltage if required at terminal “5” positive and terminal “8” negative.
If host system has remote voltage sensing capability, connect sensing wire at terminal “6” positive and terminal “7” negative.
Connect strain gauge bridge voltage supply at terminal “9” positive and terminal “12” negative.
Connect strain gauge bridge voltage sensing supply at terminal “10” positive and terminal “11” negative.
If strain gauge bridge has no internal voltage sensing capability always connect terminal "10" to terminal "9" and terminal "11" to terminal "12";
for better performance connect the wire at the end of the line near the load cells.
Connect strain gauge bridge output signal at terminal “13” positive and terminal “14” negative.

Intrinsically Safe conductors must be identified and segregated from non I.S. and wired in accordance to the relevant national/international installation standards (e.g. EN/IEC60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC), make sure that conductors are well isolated from each other and do not produce any unintentional connection.
The enclosure provides, according to EN60529, an IP20 minimum degree of mechanical protection (or similar to NEMA Standard 250 type 1) for indoor installation, outdoor installation requires an additional enclosure with higher degree of protection (i.e. IP54 to IP65 or NEMA type 12-13) consistent with the effective operating environment of the specific installation.
Units must be protected against dirt, dust, extreme mechanical (e.g. vibration, impact and shock) and thermal stress, and casual contacts.
If enclosure needs to be cleaned use only a cloth lightly moistened by a mixture of detergent in water.
Electrostatic Hazard: to avoid electrostatic hazard, the enclosure of D1063 must be cleaned only with a damp or antistatic cloth.
Any penetration of cleaning liquid must be avoided to prevent damage to the unit. Any unauthorized card modification must be avoided.
According to EN61010, D1063 series must be connected to SELV or SELV-E supplies.

Start-up

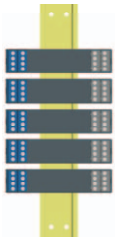
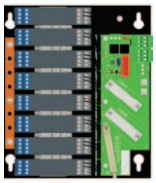
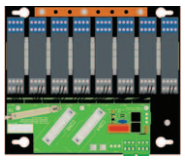
Before powering the unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires, also check that Intrinsically Safe conductors and cable trays are segregated (no direct contacts with other non I.S. conductors) and identified either by color coding, preferably blue, or by marking.
Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts.
Turn on power, the “power on” green led must be lit, the unit repeats the load cell condition, check with the weighing indicator the proper value reading.

Installation in Cabinet

Power Dissipation of D1063 Isolators
Section “Technical Data” of D1063 isolator specifies the current consumption (maximum current from the nominal power supply, typical 24 Vdc, in normal operation); this data serves to dimension the current rating of the power supply unit. Section “Technical Data” indicates also the maximum power consumption (maximum power required from the power supply in the worst (abnormal) operating conditions like for example supply voltage at 30 Vdc, short circuit on the outputs and on the inputs terminals.
The power dissipated **Pd** inside the enclosure for analog signal isolators is: **Pd = Current Consumption (A) * Supply Voltage (V) - Power Dissipated into the input/output loads**
Analog signal isolators have higher dissipation than digital signal isolators. In analog signal isolators each transmitter requires and dissipates 15 V * 0.02 A = 0.3 W. Usually the loads outside the isolator dissipate 1/3 of the total power used. Isolators are not running at the maximum current all at the same time, the average power consumption of a multitude of isolators can be considered to be only 70 % of the value obtained from the section “Technical Data”. Considering the 1/3 load power and the 70 % above discussed, the power effectively dissipated internally by the isolators can therefore become ½ of the actual power delivered by the power supply. Digital barriers dissipate all the supply power inside the enclosure consequently the total power dissipation into a cabinet, with mixed analog and digital barriers, is determined by the number of channels more than by the number of isolator enclosures.
The following tables give advises for the DIN rail orientation (vertical or horizontal) of the barriers mounting, D1063S (single channel) isolators, installed on DIN rail, bus or custom board assembly.

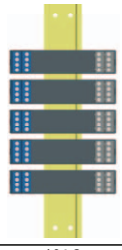
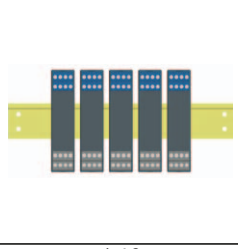
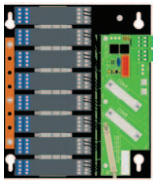
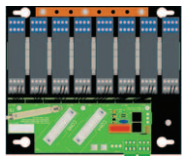
A) Cabinet with Natural Ventilation

Maximum recommended ambient temperature in °C depending on barrier type and installation method:

Type of Isolator	Single unit Installation	Installation of Multiple units with DIN-rail Bus		Installation on Custom Boards	
	Any orientation	Vertical	Horizontal	Vertical	Horizontal
					
D1063S	60°C	30°C	35°C	35°C	40°C

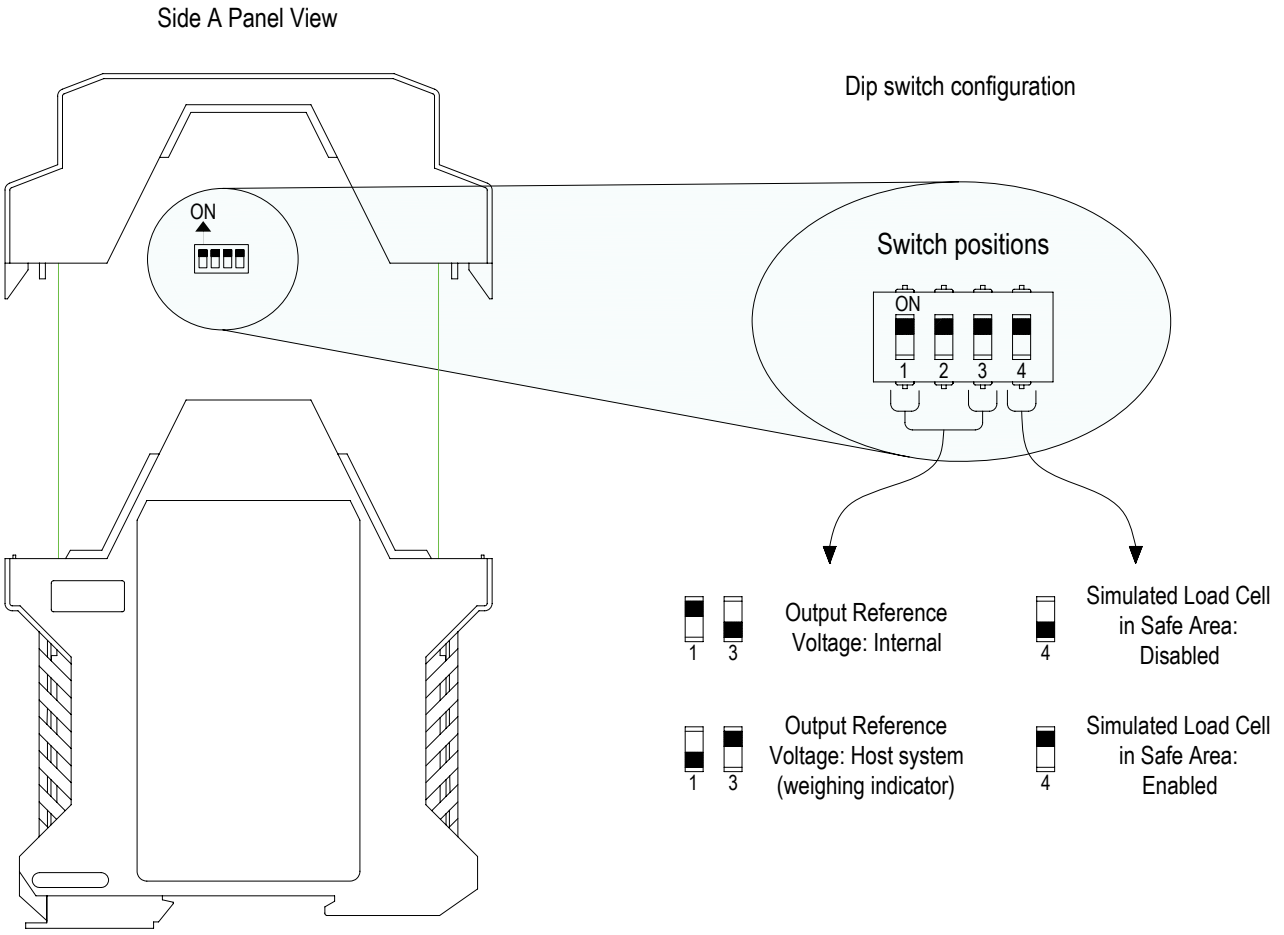
B) Cabinet with Forced Ventilation

Maximum recommended ambient temperature in °C depending on barrier type and installation method:

Type of Isolator	Single unit Installation	Installation of Multiple units with DIN-rail Bus		Installation on Custom Boards	
	Any orientation	Vertical	Horizontal	Vertical	Horizontal
					
D1063S	60°C	40°C	45°C	45°C	50°C

Configuration

Proper configuration is obtained using internal dip-switches located on component side of pcb.



NOTE: to avoid damage of unit or weighing indicator always check reference voltage setting; to change the configuration always set before the dip switch from ON to OFF position prior from OFF to ON position the other:

This configuration is wrong: Dip switch 1 and 3 don' t have to be in "ON" position at the same time.

Dip switch Configuration Summary Table

Output Reference Voltage	SW1	SW3
Internal	ON	OFF
Host system (weighing indicator)	OFF	ON

Simulated Load Cell in Safe Area	SW4
Disabled	OFF
Enabled	ON