



INSTRUCTION MANUAL

Frequency-Pulse Isolating Repeater DIN Rail Model D1035S



Characteristics

General Description: The single channel DIN Rail Frequency-Pulse Repeater D1035S, repeats a low level frequency signal from magnetic pick-up, contact, proximity, open-collector transistor sensor, TTL CMOS located in Hazardous Area, into pulse signal to drive a Safe Area load.

Function: 1 channel I.S. input from frequency-pulse signals, provides 3 port isolation (input/output/supply). Repeats the frequency input and provides one SPST transistor output.

Signalling LED: Power supply indication (green), frequency input (yellow).

Field Configurability: DIP switch configurable for hardware setting of input sensor.

EMC: Fully compliant with CE marking applicable requirements.

Technical Data

Supply: 12-24 Vdc nom (10 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.

Current consumption @ 24 V: 40 mA with output transistor energized.

Current consumption @ 12 V: 60 mA with output transistor energized.

Power dissipation: 1.0 W with 24 V supply voltage and output transistor energized.

Max. power consumption: at 30 V supply voltage, output transistor energized, 1.2 W.

Isolation (Test Voltage): I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV; Out/Supply 500 V.

Input: magnetic pick-up, contact, proximity to EN60947-5-6, open-collector transistor for frequency signals up to 50 KHz, TTL CMOS.

Input range: 0 to 50 KHz maximum.

Magnetic pick-up sensitivity: ≥ 20 mVpp up to 100 Hz input, ≥ 50 mVpp up to 1 KHz, ≥ 100 mVpp up to 5 KHz, ≥ 500 mVpp up to 20 KHz, ≥ 1 Vpp up to 50 KHz.

Switching current levels: ON ≥ 2.1 mA, OFF ≤ 1.2 mA, switch current ≈ 1.65 mA ± 0.2 mA hysteresis (for proximity or transistor input).

Equivalent source: 8 V 1 K Ω typical (8 V no load, 8 mA short circuit).

Repeater Output: voltage free SPST optocoupled open-collector transistor.

Open-collector rating: 100 mA at 35 V (≤ 1.5 V voltage drop).

Leakage current: ≤ 50 μ A at 35 V.

Frequency response: 50 KHz maximum.

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) G [Ex ia Ga] IIC, II (1) D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I, II 3G Ex nA II T4, [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I associated electrical apparatus.

Uo/Voc = 10.9 V, Io/Isc = 1.1 mA, Po/Po = 3 mW at terminals 13-16.

Uo/Voc = 15.5 V, Io/Isc = 13 mA, Po/Po = 48 mW at terminals 14-15.

Uo/Voc = 10.9 V, Io/Isc = 23 mA, Po/Po = 60 mW at terminals 15-16.

Ui/Vmax = 30 V, Ci = 0 nF, Li = 0 nH at terminals 13-16.

Um = 250 Vrms, -20 °C \leq Ta \leq 60 °C.

Approvals: DMT 01 ATEX E 042 X conforms to EN60079-0, EN60079-11, EN60079-26, EN61241-0, EN61241-11,

IECEX BVS 07.0027X conforms to IEC60079-0, IEC60079-11, IEC60079-26, IEC61241-0, IEC61241-11, 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,

KR Type Approval Certificate for marine applications.

Mounting: T35 DIN Rail according to EN50022.

Weight: about 145 g.

Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm².

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.

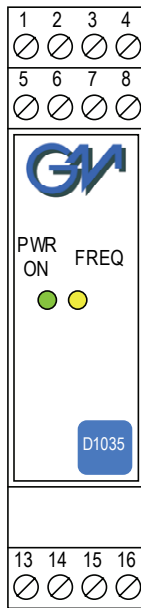
Protection class: IP 20.

Dimensions: Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

Ordering information

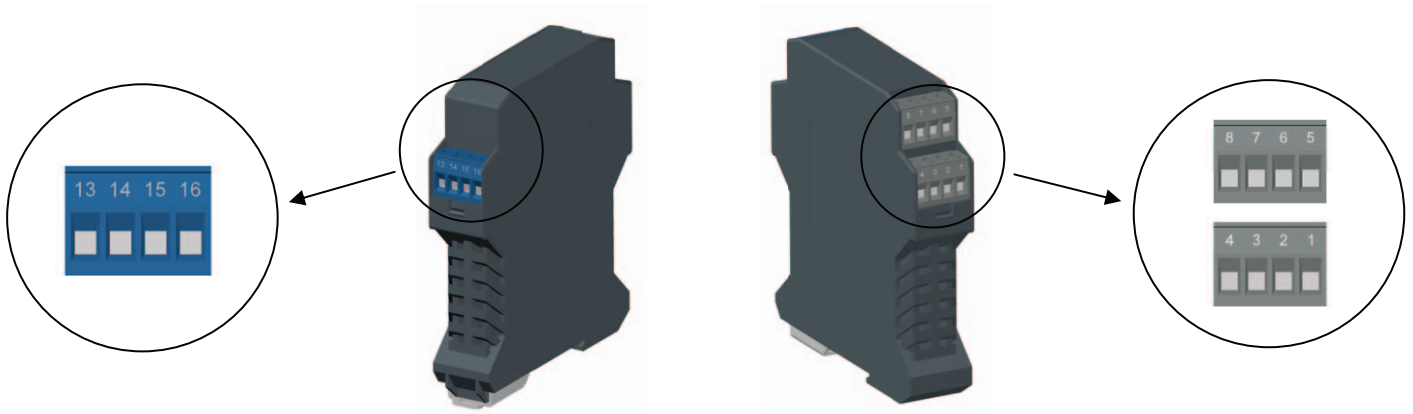
Model:	D1035S	
Power Bus enclosure	/B	

Front Panel and Features



- Input from Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- Magnetic pick-up or proximity input sensor.
- Input frequency range from 0 to 50 KHz.
- 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 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

- | | |
|-----------|--|
| 13 | Input Ch 1 for Magnetic pick-up |
| 14 | + Input Ch 1 for Proximity or for voltage free Contact or
+ Input Ch 1 for Open Collector |
| 15 | - Input Ch 1 for Proximity or voltage free Contact or
Open Collector or + Input Ch 1 for TTL / CMOS |
| 16 | Input Ch 1 for Magnetic Pick-up or
- Input Ch 1 for TTL / CMOS |

SAFE AREA

- | | |
|----------|-----------------------|
| 1 | Not used |
| 2 | Not used |
| 3 | + Power Supply 24 Vdc |
| 4 | - Power Supply 24 Vdc |
| 5 | + Output Repeater |
| 6 | - Output Repeater |
| 7 | Not used |
| 8 | Not used |

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 (U_i/V_{max} , I_i/I_{max} , P_i/P_i) are not exceeded by the safety parameters (U_o/V_{oc} , I_o/I_{sc} , P_o/P_o) of the D1035 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 (C_o/C_a , L_o/L_a , L_o/R_o) given in the Associated Apparatus parameters for the effective gas group. See parameters on enclosure side and the ones indicated in the table below:

D1035 Terminals		D1035 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
Ch1	13 - 16	$U_o / V_{oc} = 10.9 \text{ V}$	\leq	U_i / V_{max}
Ch1	14 - 15	$U_o / V_{oc} = 15.5 \text{ V}$		
Ch1	15 - 16	$U_o / V_{oc} = 10.9 \text{ V}$		
Ch1	13 - 16	$I_o / I_{sc} = 1.1 \text{ mA}$	\leq	I_i / I_{max}
Ch1	14 - 15	$I_o / I_{sc} = 13 \text{ mA}$		
Ch1	15 - 16	$I_o / I_{sc} = 23 \text{ mA}$		
Ch1	13 - 16	$P_o / P_o = 3 \text{ mW}$	\leq	P_i / P_i
Ch1	14 - 15	$P_o / P_o = 48 \text{ mW}$		
Ch1	15 - 16	$P_o / P_o = 60 \text{ mW}$		

D1035 Terminals		D1035 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
Ch1	13 - 16	$C_o / C_a = 2.05 \mu\text{F}$ (IIC-A, B) $C_o / C_a = 14.4 \mu\text{F}$ (IIB-C) $C_o / C_a = 63 \mu\text{F}$ (IIA-D)	\geq	$C_i / C_i \text{ device} + C \text{ cable}$
Ch1	14 - 15	$C_o / C_a = 508 \text{ nF}$ (IIC-A, B) $C_o / C_a = 3.11 \mu\text{F}$ (IIB-C) $C_o / C_a = 12.5 \mu\text{F}$ (IIA-D)		
Ch1	15 - 16	$C_o / C_a = 2.05 \mu\text{F}$ (IIC-A, B) $C_o / C_a = 14.40 \mu\text{F}$ (IIB-C) $C_o / C_a = 63.00 \mu\text{F}$ (IIA-D)		
Ch1	13 - 16	$L_o / L_a = 29 \text{ H}$ (IIC-A, B) $L_o / L_a = 117 \text{ H}$ (IIB-C) $L_o / L_a = 235 \text{ H}$ (IIA-D)	\geq	$L_i / L_i \text{ device} + L \text{ cable}$
Ch1	14 - 15	$L_o / L_a = 235 \text{ mH}$ (IIC-A, B) $L_o / L_a = 941 \text{ mH}$ (IIB-C) $L_o / L_a = 1883 \text{ mH}$ (IIA-D)		
Ch1	15 - 16	$L_o / L_a = 72 \text{ mH}$ (IIC-A, B) $L_o / L_a = 290 \text{ mH}$ (IIB-C) $L_o / L_a = 580 \text{ mH}$ (IIA-D)		
Ch1	13 - 16	$L_o / R_o = 12 \text{ mH}/\Omega$ (IIC-A, B) $L_o / R_o = 48.1 \text{ mH}/\Omega$ (IIB-C) $L_o / R_o = 96.2 \text{ mH}/\Omega$ (IIA-D)	\geq	$L_i / R_i \text{ device and}$ $L \text{ cable} / R \text{ cable}$
Ch1	14 - 15	$L_o / R_o = 585 \mu\text{H}/\Omega$ (IIC-A, B) $L_o / R_o = 2342 \mu\text{H}/\Omega$ (IIB-C) $L_o / R_o = 4685 \mu\text{H}/\Omega$ (IIA-D)		
Ch1	15 - 16	$L_o / R_o = 594 \mu\text{H}/\Omega$ (IIC-A, B) $L_o / R_o = 2378 \mu\text{H}/\Omega$ (IIB-C) $L_o / R_o = 4757 \mu\text{H}/\Omega$ (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 (U_i/V_{max}) of the D1035 Associated Apparatus are not exceeded by the safety parameters (U_o/V_{oc}) of the Intrinsically Safe device, indicated in the table below:

D1035 Terminals		D1035 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
Ch1	13 - 16	$U_i / V_{max} = 30V$	\geq	U_o / V_{oc}
Ch2	13 - 16	$C_i = 0 \text{ nF}, L_i = 0 \text{ nH}$		

For installations in which both the C_i and L_i of the Intrinsically Safe apparatus exceed 1 % of the C_o and L_o parameters of the Associated Apparatus (excluding the cable), then 50 % of C_o and L_o parameters are applicable and shall not be exceeded (50 % of the C_o and L_o become the limits which must include the cable such that $C_i \text{ device} + C \text{ cable} \leq 50 \% \text{ of } C_o$ and $L_i \text{ device} + L \text{ cable} \leq 50 \% \text{ of } L_o$).

If the cable parameters are unknown, the following value may be used: Capacitance 60pF per foot (180pF per meter), Inductance 0.20 μ H per foot (0.60 μ H 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.

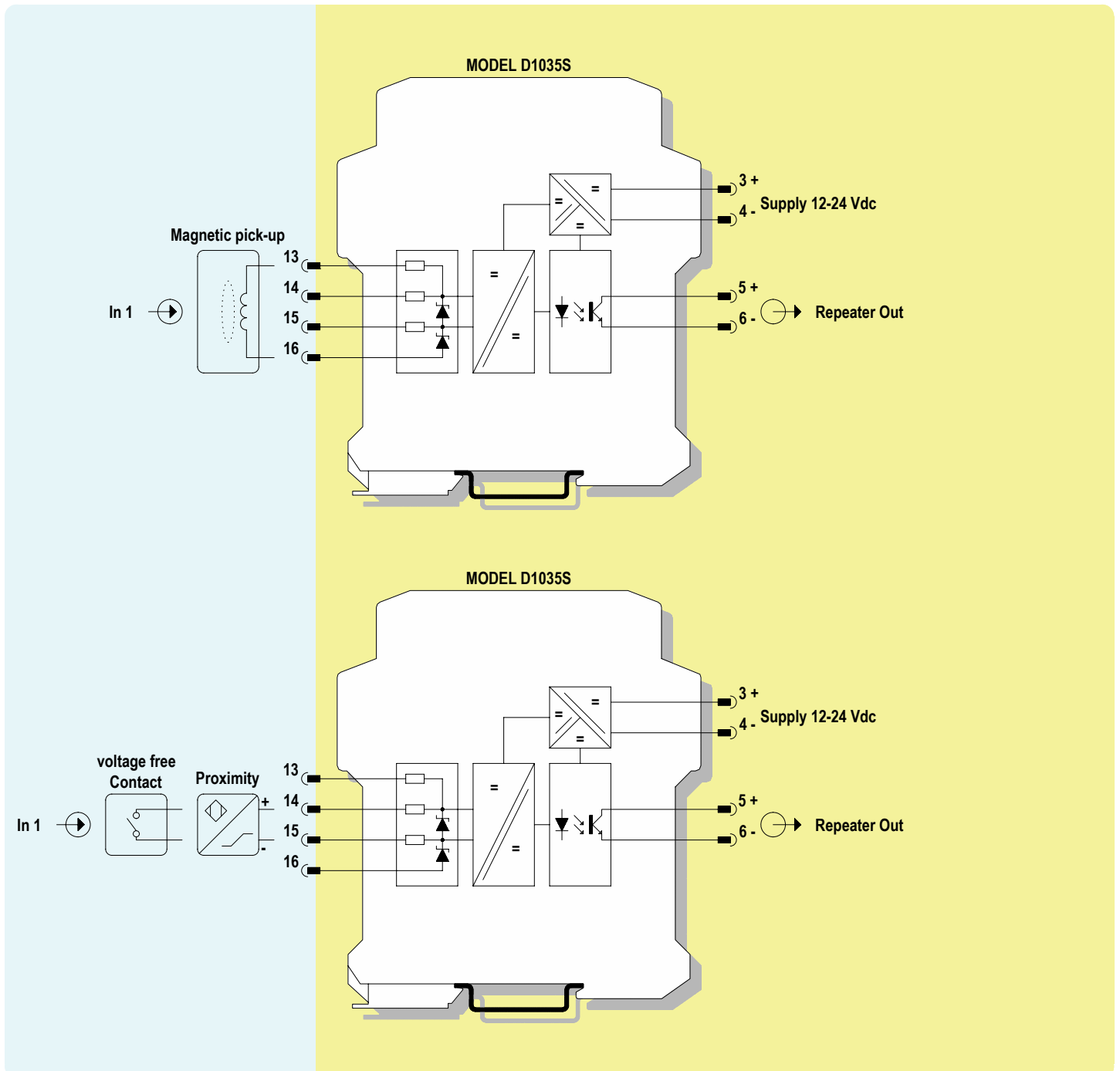
For Division 1 and Zone 0 installations, the configuration of Intrinsically Safe Equipment must be FM approved under Entity Concept (or third party approved);

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

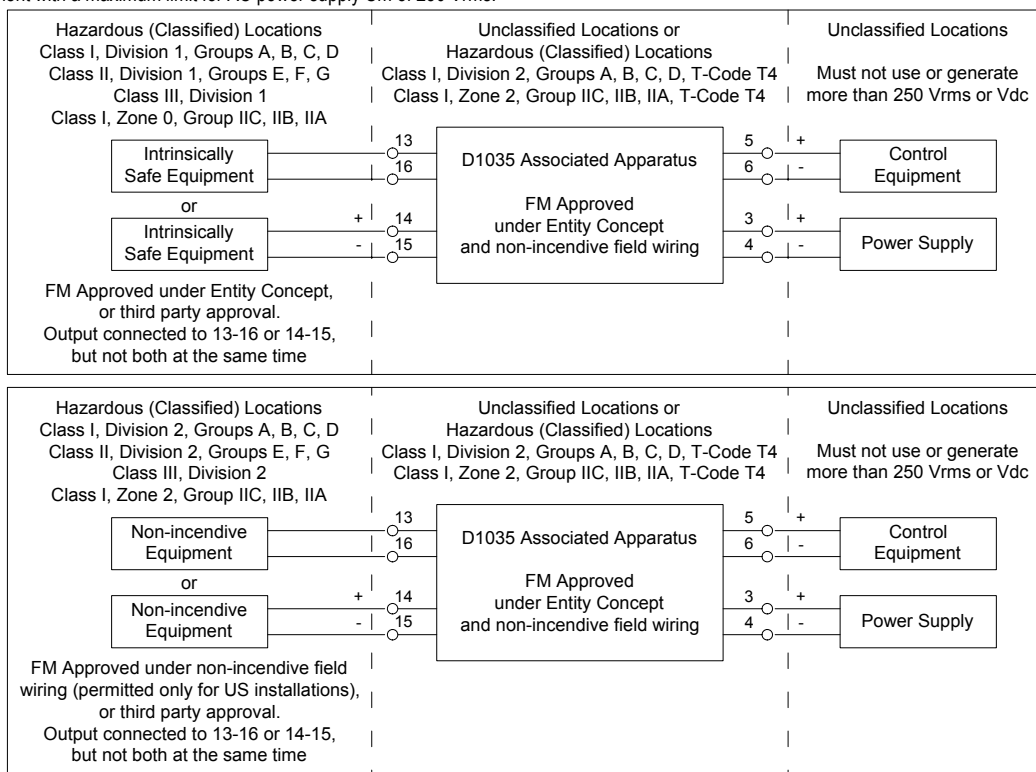
HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

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



Warning

D1035 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 D1035 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.

D1035 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

Input channel of D1035 accepts a frequency signal from Hazardous Area/Hazardous Locations (magnetic pick-up, proximity) and repeats while isolating the signal to an optocoupled transistor to drive a load in Safe Area/Non Hazardous Locations. Presence of supply power is displayed by a green signalling LED, input frequency is displayed by a yellow LED.

Installation

D1035 is a frequency isolating repeater housed in a plastic enclosure suitable for installation on T35 DIN Rail according to EN50022.

D1035 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 12-24 Vdc power supply positive at terminal "3" and negative at terminal "4".

Connect positive transistor output at terminal "5" and negative at "6".

For a magnetic pick up input, connect high wire at terminal "13", low and shield (if any) at terminal "16".

For a proximity, contact and open collector sensor input, connect positive wire at terminal "14", negative at terminal "15".

For a TTL CMOS input, connect positive wire at terminal "15", negative at terminal "16".

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.

Connect SPST output transistors checking the load rating to be within the maximum rating (100 mA, 35 V resistive load).

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 D1035 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, D1035 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, output must be in accordance with the corresponding input signal.

Installation in Cabinet


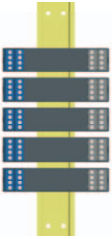

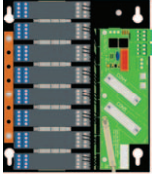
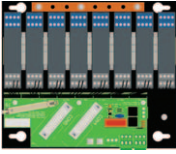
Power Dissipation of D1035 Isolators

Section "Technical Data" of D1035 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 P_d inside the enclosure for analog signal isolators is: $P_d = \text{Current Consumption (A)} * \text{Supply Voltage (V)} - \text{Power Dissipated into the input/output loads}$
 Digital signal isolators have lower dissipation than analog signal isolators. 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 1/2 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, D1035S (single channel) isolators, installed on DIN rail, bus or custom board assembly.


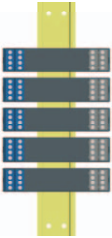
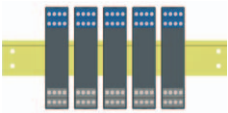
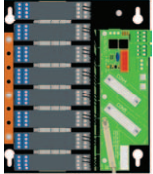
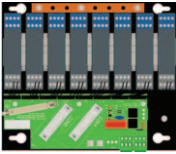
A) Cabinet with Natural Ventilation

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
					
D1035S	60°C	30°C	35°C	35°C	40°C

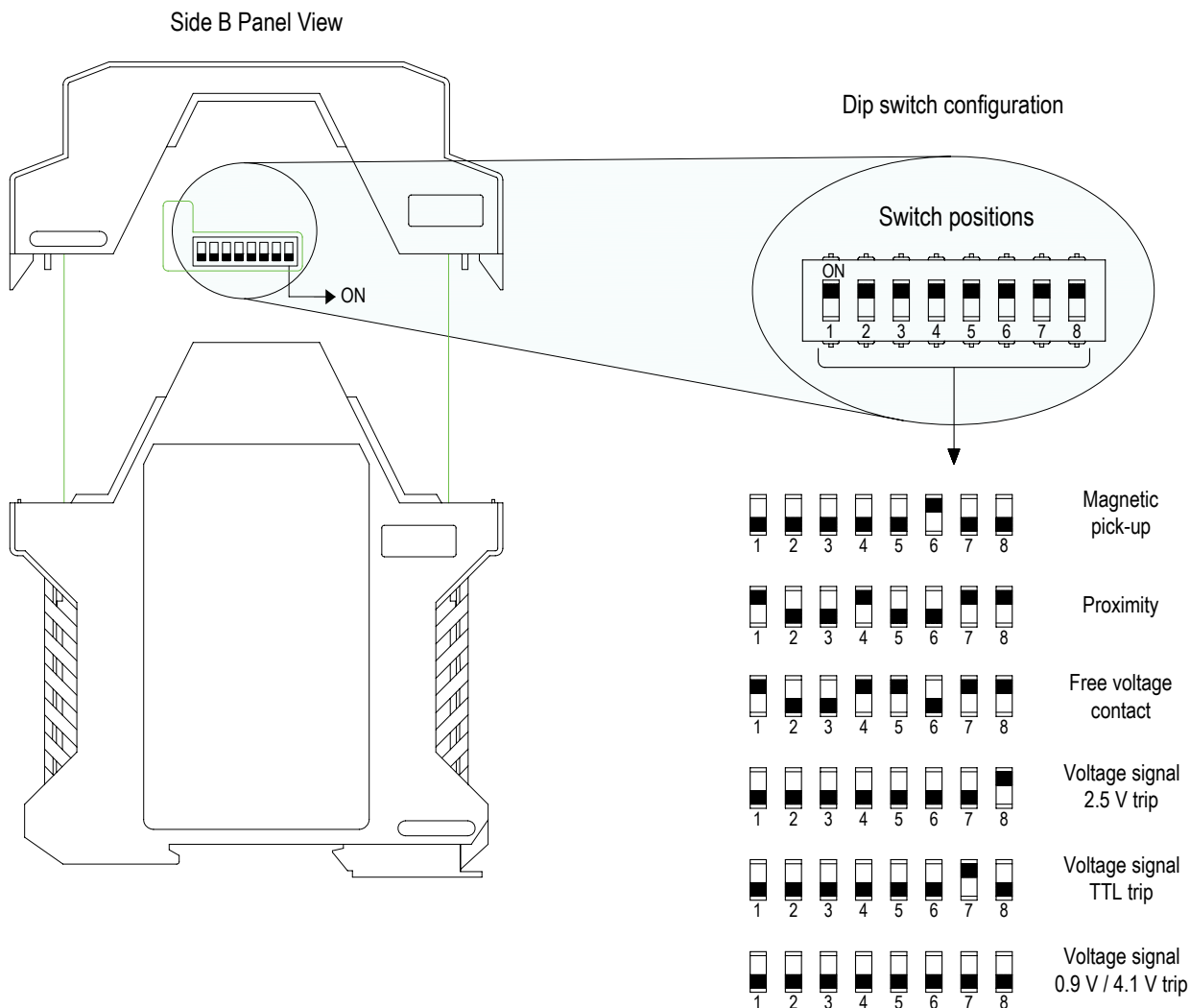
B) Cabinet with Forced Ventilation

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
					
D1035S	60°C	40°C	45°C	45°C	50°C

Configuration

A hardware configuration DIP switch is located on component side of pcb. This switch allows the configuration of input sensor type.



Dip switch Configuration Summary Table

INPUT Sensor	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Magnetic pick-up	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
Proximity	ON	OFF	OFF	ON	OFF	OFF	ON	ON
Free voltage contact	ON	OFF	OFF	ON	ON	OFF	ON	ON
Voltage signal 2.5 V trip	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
Voltage signal TTL trip	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
Voltage signal 0.9 V / 4.1 V trip	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF