



# INSTRUCTION MANUAL

RS422/RS485 Fieldbus  
Isolating Repeater  
DIN-Rail Model D1061S-077

## Characteristics

**General Description:** The DIN-Rail RS422 / RS485 Fieldbus Isolating Repeater type D1061S-077 is used to separate Intrinsically Safe RS422 / RS485 equipment located in Hazardous Area from a RS232 / RS422 / RS485 controller located in Safe Area. Transmission speed is DIP-switch adjustable from 1.2 Kbit/s up to 1.5 Mbit/s. Terminating impedance is DIP-switch selectable inside the unit (200  $\Omega$  value) for both sides of communication lines (Hazardous Area and Safe Area side). RS422 / RS485 connection in Safe Area is provided both on terminal block and SUB D 9 poles female connector on the unit. RS232 connection is provided on SUB D 9 poles female connector only. The module also provides a shield terminal block for connecting cable shielding on Hazardous Area side.

**Function:** 1 channel I.S. RS422 / RS485 isolating repeater, provides 3 port isolation (input/output/supply).

**Signalling LEDs:** Power supply indication (green), Rx-Tx transmission (yellow).

**Field Configurability:** Hardware is totally configurable via DIP-switches; parameters are: transmission speed adjustable from 1.2 Kbit/s up to 1.5 Mbit/s; terminating impedance enabled or disabled in both communication lines; RS422 / RS485 connection selection from terminal blocks or SUB D 9 poles female connector.

**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  $\leq 5$  Vpp.

**Current consumption @ 24 V:** 100 mA with 1.5 Mbit/s transmission speed, typical.

**Power dissipation:** 2.0 W with 24 V supply and 1.5 Mbit/s transmission speed typical.

**Max. power consumption:** at 30 V supply and 1.5 Mbit/s transmission speed, 2.8 W.

**Isolation (Test Voltage):** I.S. RS422-RS485 / RS232-RS422-RS485 1.5 KV; I.S. RS422-RS485 / Supply 1.5 KV; RS232-RS422-RS485 / Supply 500 V.

**Input/Output I.S. Hazardous Area:** RS422 / RS485 Intrinsically Safe connection (EIA RS422-A and EIA RS485 applicable standard).

**Terminating impedance:** 200  $\Omega$  DIP-switch selectable.

**Transmission speed:** 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 38.4, 57.6, 93.75, 115.2, 187.5, 375, 500, 750 Kbit/s or 1.0, 1.5 Mbit/s DIP-switch configurable.

**Transmission cable length:**  $\leq 1200$  m up to 93.75 Kbit/s,  $\leq 1000$  m up to 187.5 Kbit/s,  $\leq 400$  m up to 500 Kbit/s,  $\leq 200$  m up to 1.5 Mbit/s.

**Connection:** by plug-in disconnect screw terminal block to accommodate terminations up to 2.5 mm<sup>2</sup>, shield terminal block provided for cable connection.

**Output/Input Safe Area:** RS232 / RS422 / RS485 connection (EIA RS232-C, EIA RS422-A and EIA RS485 applicable standard).

**RS422 / RS485 Terminating impedance:** 200  $\Omega$  DIP-switch selectable.

**RS422 / RS485 Transmission speed:** 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 38.4, 57.6, 93.75, 115.2, 187.5, 375, 500, 750 Kbit/s or 1.0, 1.5 Mbit/s DIP-switch configurable.

**RS422 / RS485 Transmission cable length:**  $\leq 1200$  m up to 93.75 Kbit/s,  $\leq 1000$  m up to 187.5 Kbit/s,  $\leq 400$  m up to 500 Kbit/s,  $\leq 200$  m up to 1.5 Mbit/s.

**RS422 / RS485 Connection:** by plug-in disconnect screw terminal block to accommodate terminations up to 2.5 mm<sup>2</sup> or SUB D 9 poles female connector (requires SUB D 9 poles male mating connector), DIP-switch configurable.

**RS232 Transmission speed:** 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 38.4, 57.6, 93.75, 115.2 Kbit/s DIP-switch configurable.

**RS232 Transmission cable length:**  $\leq 15$  m up to 115.2 Kbit/s.

**RS232 Connection:** SUB D 9 poles female connector (requires SUB D 9 poles male mating connector).

**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:**

 **ATEX:** II 3(1) G Ex nA [ja Ga] IIC T4 Gc, II (1) D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I

**IECEx:** Ex nA [ja Ga] IIC T4 Gc, [Ex ia Da] IIIC, [Ex ia Ma] I, associated apparatus and non-sparking electrical equipment.

Uo/Voc = 3.7 V, Io/Isc = 93 mA, Po/Po = 85 mW at terminals 13-14 and 15-16.

Ui/Vmax = 30 V, Ii/Imax = 136 mA, Ci = 0 nF, Li = 0 nH at terminals 13-14 and 15-16.

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

**Approvals:**

DMT 01 ATEX E 042 X conforms to EN60079-0, EN60079-11, EN60079-15, EN60079-26, EN61241-11, IECEx BVS 07.0027X conforms to IEC60079-0, IEC60079-11, IEC60079-15, IEC60079-26, IEC61241-11.

**Mounting:** T35 DIN Rail according to EN50022.

**Weight:** about 170 g.

**Connection:** by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm<sup>2</sup> and SUB D 9 poles (DB9) DIN 41652 female connector (only for RS232, RS422, RS485 Safe Area connection).

**Location:** Safe Area or Zone 2, Group IIC T4 installation.

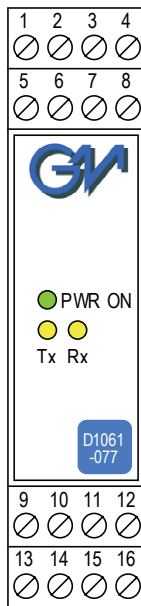
**Protection class:** IP 20.

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

## Ordering Information

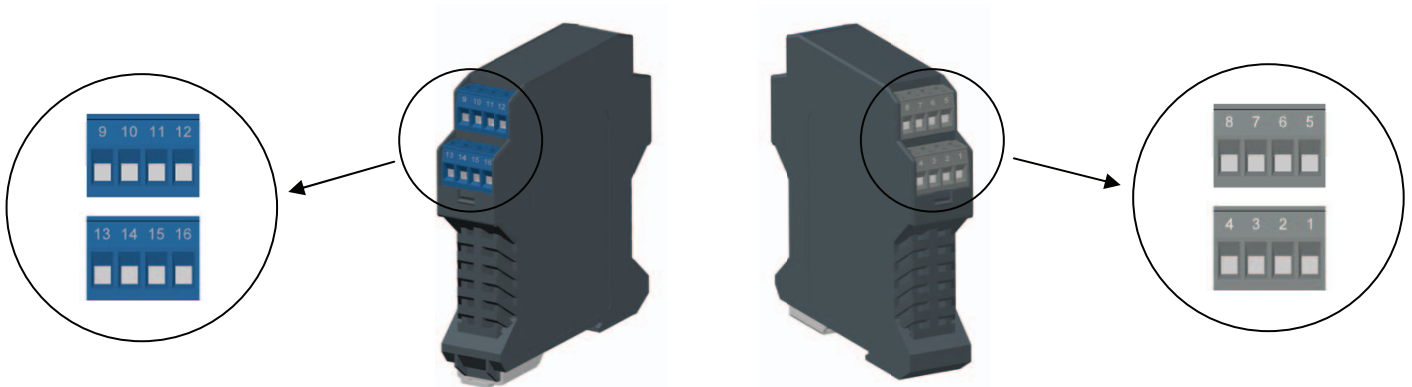
Model:	D1061S-077	
Power Bus enclosure		/B

## Front Panel and Features



- Input/Output from Zone 0 (Zone 20), installation in Zone 2.
- RS422 / RS485 Hazardous Area I.S. Signal.
- RS232 / RS422 / RS485 Safe Area Signal.
- Transmission speed up to 1.5 Mbit/s.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- In-field programmability by DIP Switch.
- ATEX, IECEx Certifications.
- 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

<b>9</b>	To shield
<b>10</b>	To shield
<b>11</b>	Not used
<b>12</b>	Not used
<b>13</b>	A - for IN/OUT RS485 or TxD RS422
<b>14</b>	B + for IN/OUT RS485 or TxD RS422
<b>15</b>	A - for RxD RS422
<b>16</b>	B - for RxD RS422

### SAFE AREA

<b>1</b>	Not used
<b>2</b>	Not used
<b>3</b>	+ Power Supply 24 Vdc
<b>4</b>	- Power Supply 24 Vdc
<b>5</b>	A - for IN/OUT RS485 or TxD RS422
<b>6</b>	B + for IN/OUT RS485 or TxD RS422
<b>7</b>	A - for RxD RS422
<b>8</b>	B - for RxD RS422

## Parameters Table

In the system safety analysis, always check the Hazardous Area devices to conform with the related system documentation, if the device is Intrinsically Safe check its suitability for the Hazardous Area and group encountered and that its maximum allowable voltage, current, power ( $U_i/V_{max}$ ,  $l_i/l_{max}$ ,  $P_i/P_i$ ) are not exceeded by the safety parameters ( $U_o/V_{oc}$ ,  $l_o/l_{sc}$ ,  $P_o/P_o$ ) of the D1061-077 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 group. See parameters on enclosure side and the ones indicated in the table below:

D1061-077 Terminals	D1061-077 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
13 - 14 15 - 16	$U_o / V_{oc} = 3.7 \text{ V}$	$\leq$	$U_i / V_{max}$
13 - 14 15 - 16	$l_o / l_{sc} = 93 \text{ mA}$	$\leq$	$l_i / l_{max}$
13 - 14 15 - 16	$P_o / P_o = 85 \text{ mW}$	$\leq$	$P_i / P_i$
D1061-077 Terminals	D1061-077 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
13 - 14 15 - 16	$C_o / C_a = 100 \mu\text{F}$ IIC $C_o / C_a = 1000 \mu\text{F}$ IIB $C_o / C_a = 1000 \mu\text{F}$ IIA	$\geq$	$C_i / C_i$ device + C cable
13 - 14 15 - 16	$L_o / L_a = 4.1 \text{ mH}$ IIC $L_o / L_a = 16.7 \text{ mH}$ IIB $L_o / L_a = 33.4 \text{ mH}$ IIA	$\geq$	$L_i / L_i$ device + L cable
13 - 14 15 - 16	$L_o / R_o = 422.7 \mu\text{H}/\Omega$ IIC $L_o / R_o = 1690.9 \mu\text{H}/\Omega$ IIB $L_o / R_o = 3381.9 \mu\text{H}/\Omega$ IIA	$\geq$	$L_i / R_i$ device and L cable / R cable

When used with separate powered intrinsically safe devices, check that maximum allowable voltage, current ( $U_i/V_{max}$ ,  $l_i/l_{max}$ ) of the D1061-077 Associated Apparatus are not exceeded by the safety parameters ( $U_o/V_{oc}$ ,  $l_o/l_{sc}$ ) of the Intrinsically Safe device, indicated in the table below:

D1061-077 Terminals	D1061-077 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
13 - 14 15 - 16	$U_i / V_{max} = 30\text{V}$	$\geq$	$U_o / V_{oc}$
13 - 14 15 - 16	$l_i / l_{max} = 136 \text{ mA}$	$\geq$	$l_o / l_{sc}$
13 - 14 15 - 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  $C_i$  device + C cable  $\leq$  50 % of  $C_o$  and  $L_i$  device + L cable  $\leq$  50 % of  $L_o$ ).

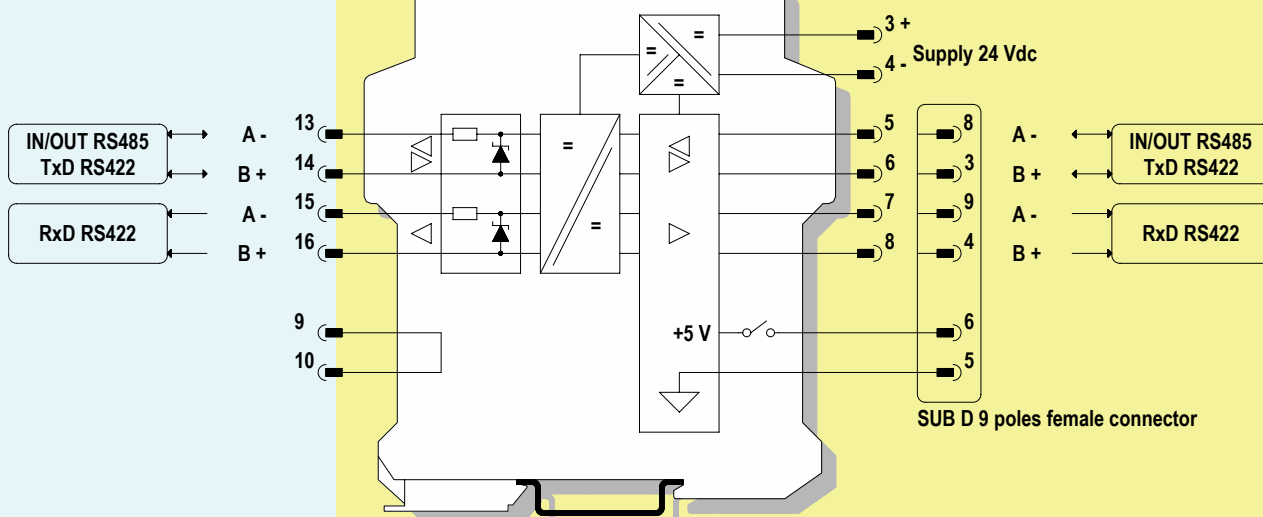
If the cable parameters are unknown, the following value may be used: Capacitance 60pF per foot (180pF per meter), inductance 0.20 $\mu\text{H}$  per foot (0.60 $\mu\text{H}$  per meter).

# Function Diagram

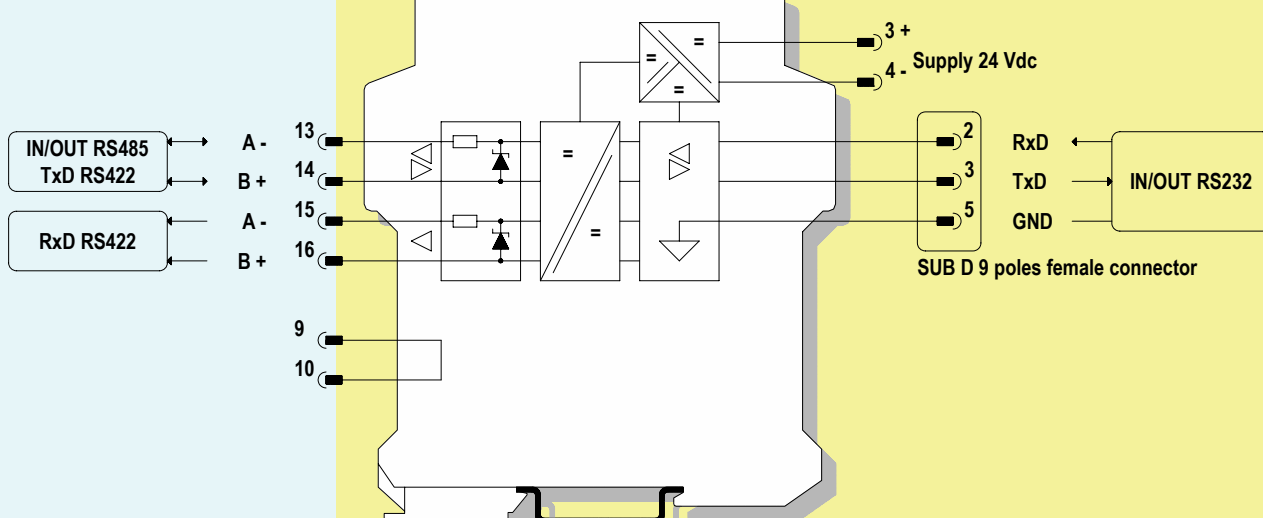
HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC

SAFE AREA, ZONE 2 GROUP IIC T4

MODEL D1061S-077

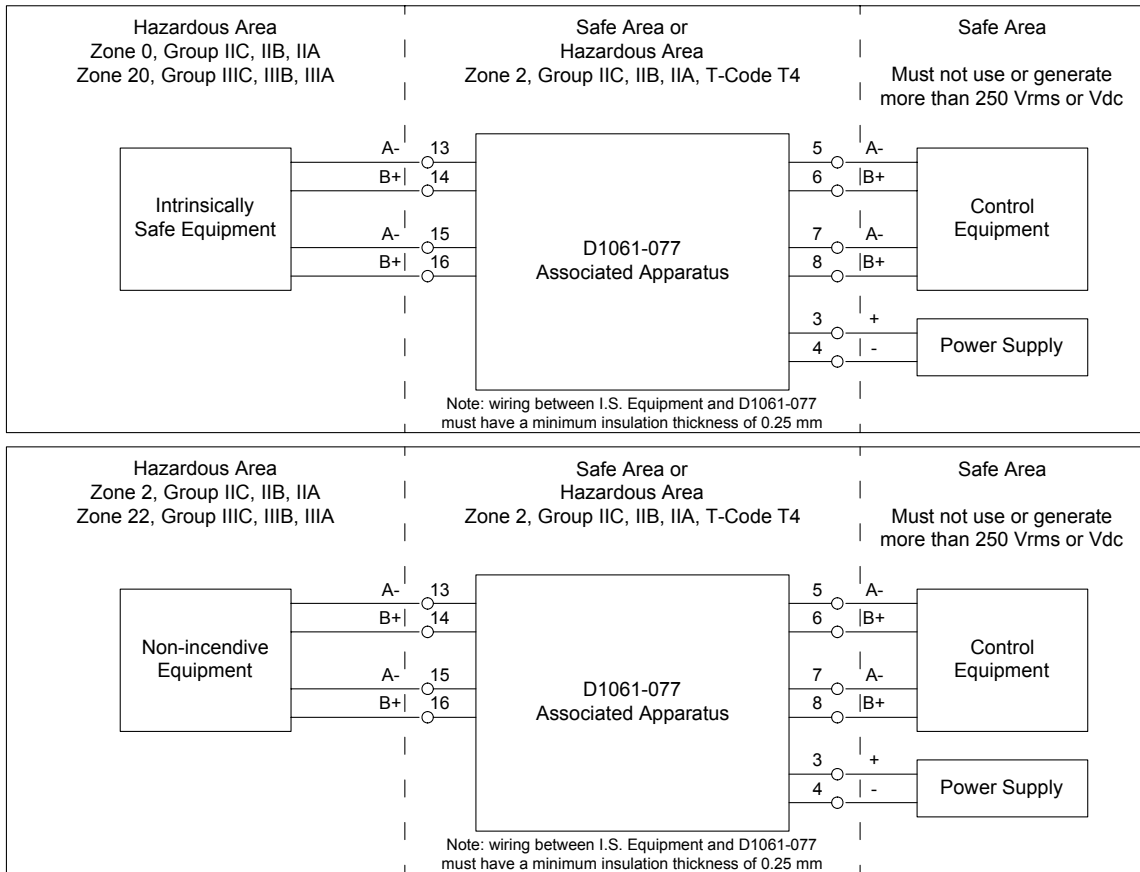


MODEL D1061S-077



## Warning

D1061-077 is an isolated Intrinsically Safe Associated Apparatus installed into standard EN50022 T35 DIN Rail located in Safe Area or Zone 2, Group IIC, Temperature Classification T4 Hazardous Area (according to EN/IEC60079-15) 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.



The wiring between the Intrinsically Safe Equipment located in Hazardous Area and the D1061-077 Associated Apparatus must have a minimum insulation thickness of 0.25 mm. Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground.

D1061-077 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 or unless area is known to be nonhazardous.

**Warning: substitution of components may impair Intrinsic Safety and suitability for 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

The DIN-Rail RS422 / RS485 Fieldbus Isolating Repeater type D1061S-077 is used to separate Intrinsically Safe RS422 / RS485 equipment located in Hazardous Area from a RS232 / RS422 / RS485 controller located in Safe Area. Transmission speed is DIP-switch adjustable from 1.2 Kbit/s up to 1.5 Mbit/s.

Terminating impedance is DIP-switch selectable inside the unit (200 Ω value) for both sides of communication lines (Hazardous Area and Safe Area side).

RS422 / RS485 connection in Safe Area is provided both on terminal block and SUB D 9 poles female connector on the unit.

RS232 connection is provided on SUB D 9 poles female connector only. The module also provides a shield terminal block for connecting cable shielding on Hazardous Area side.

A "POWER ON" green led lits when input power is present, two yellow leds monitor the transmission activities.

## Installation

D1061-077 is a RS232/RS422/RS485 fieldbus isolating repeater housed in a plastic enclosure suitable for installation on T35 DIN Rail according to EN50022.

D1061-077 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 mm<sup>2</sup> 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 RS232, RS422 and RS485 serial line connection in Safe Area, a SUB D 9 poles female connector is also provided (for Zone 2 installations check the area to be nonhazardous before servicing).

The wiring cables have to be proportionate in relation 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 field serial line type RS485 or receiving section of RS422 in Hazardous Area at terminal "13" and "14" corresponding to A- and B+.

In addition when using RS422 serial line, connect transmitting section at terminal "15" and "16" corresponding to A- and B+.

Connect field serial line type RS485 or receiving section of RS422 in Safe Area at terminal "5" and "6" corresponding to A- and B+.

In addition when using RS422 serial line, connect transmitting section at terminal "7" and "8" corresponding to A- and B+.

Safe Area side connection are also available on SUB D 9 poles female connector.

**Note:** please pay attention to the serial cable used for Safe Area connection. The internal wiring of the cable must be straight.

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 wiring between the Intrinsically Safe Equipment located in Hazardous Area and the D1061-077 Associated Apparatus must have a minimum insulation thickness of 0.25 mm.

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 D1061-077 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, D1061-077 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, transmission led should reflect the communication line activity.

## Installation in Cabinet

### Power Dissipation of D1061-077 Isolators

Section "Technical Data" of D1061-077 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 input terminals.




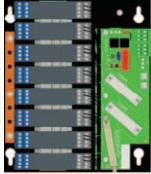
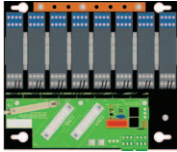
The power dissipated  $P_d$  inside the enclosure is:  $P_d = \text{Current Consumption (A)} * \text{Supply Voltage (V)} - \text{Power Dissipated into the input/output loads}$

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 power dissipated by the load (typical 1/5 of input power), and the 70 % above discussed, the power effectively dissipated internally by the isolators can therefore become 60 % of the actual power delivered by the power supply.

The following tables give advises for DIN-Rail orientation (vertical or horizontal) of barriers mounting, or installation on custom board assembly.


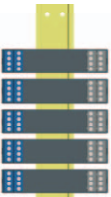
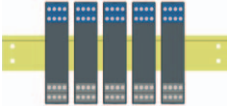
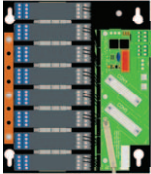
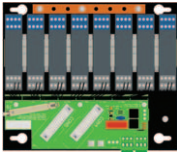
#### A) Cabinet with Natural Ventilation

Maximum recommended ambient temperature in °C depending on 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
					
D1061S-077	60°C	30°C	35°C	35°C	40°C

#### B) Cabinet with Forced Ventilation

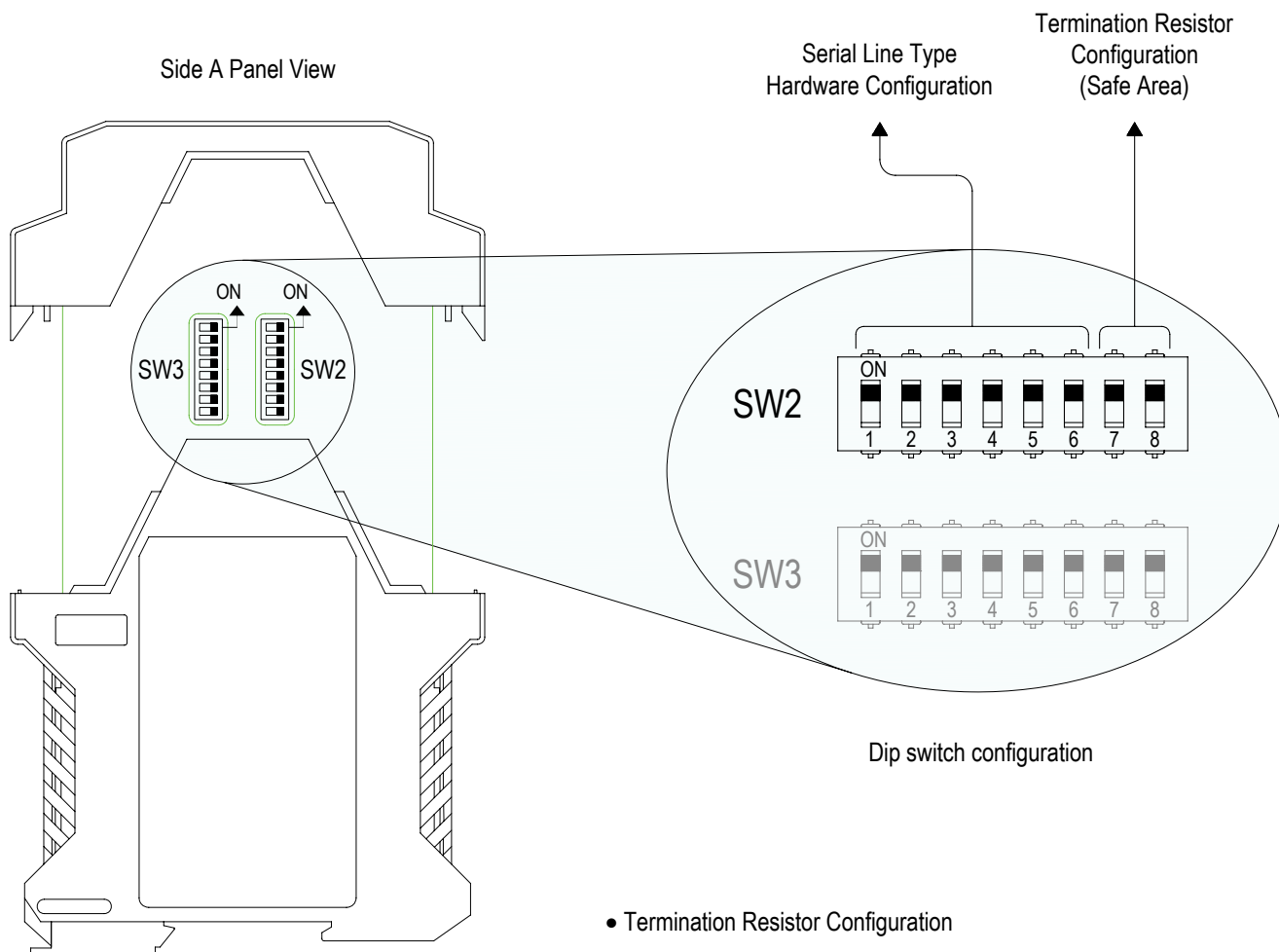
Maximum recommended ambient temperature in °C depending on installation method:

Type of Isolator	Single unit Installation	Installation of Multiple units with DIN-Rail Bus		Installation on Custom Boards	
	Any orientation	Vertical	Horizontal	Vertical	Horizontal
					
D1061S-077	60°C	40°C	45°C	45°C	55°C

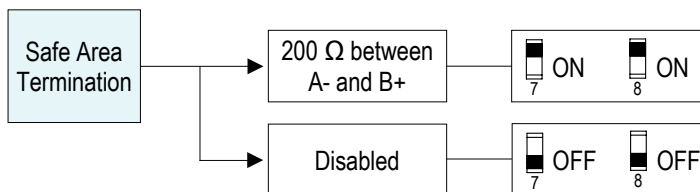


## Configuration

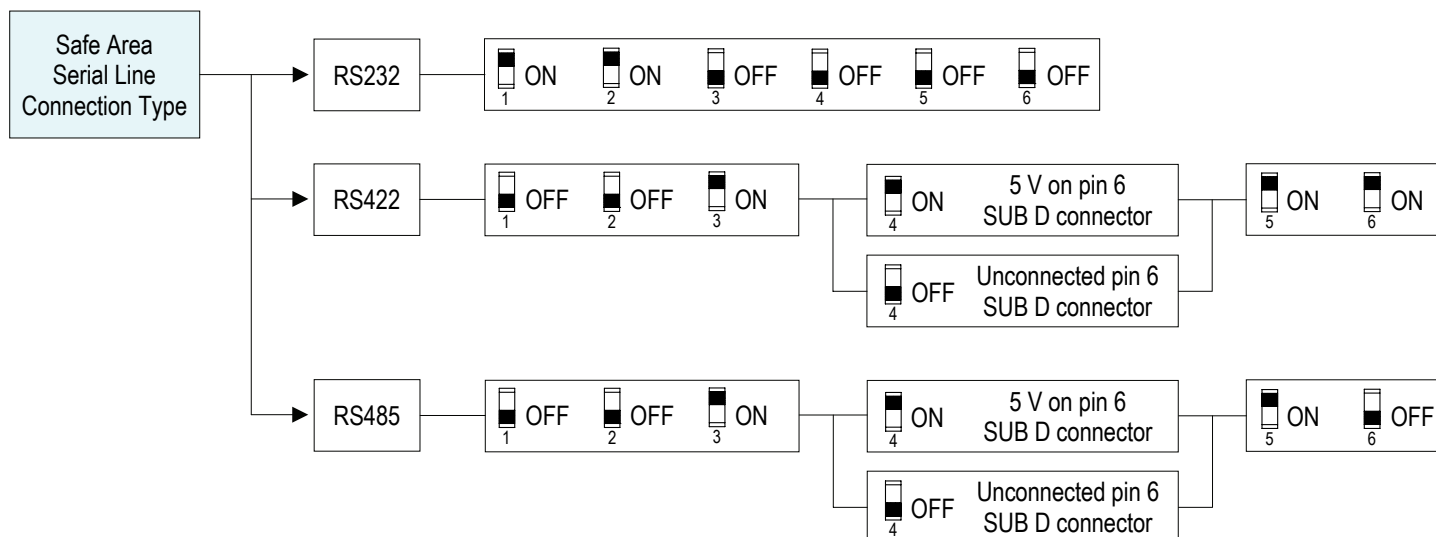
Proper configuration is obtained using internal dip-switches. The user can configure the operating mode on both Hazardous and Safe side, as RS422, RS485, RS232 (RS232 is available only on Safe side), the baud rate of the communication from 1200 b/s to 1.5 Mb/s and the frame length of a byte, indicated as data size (7 or 8 bit), parity (none, even or odd) and number of stop bit (1 or 2). The connection of line terminating resistors can also be configured.



• **Termination Resistor Configuration**

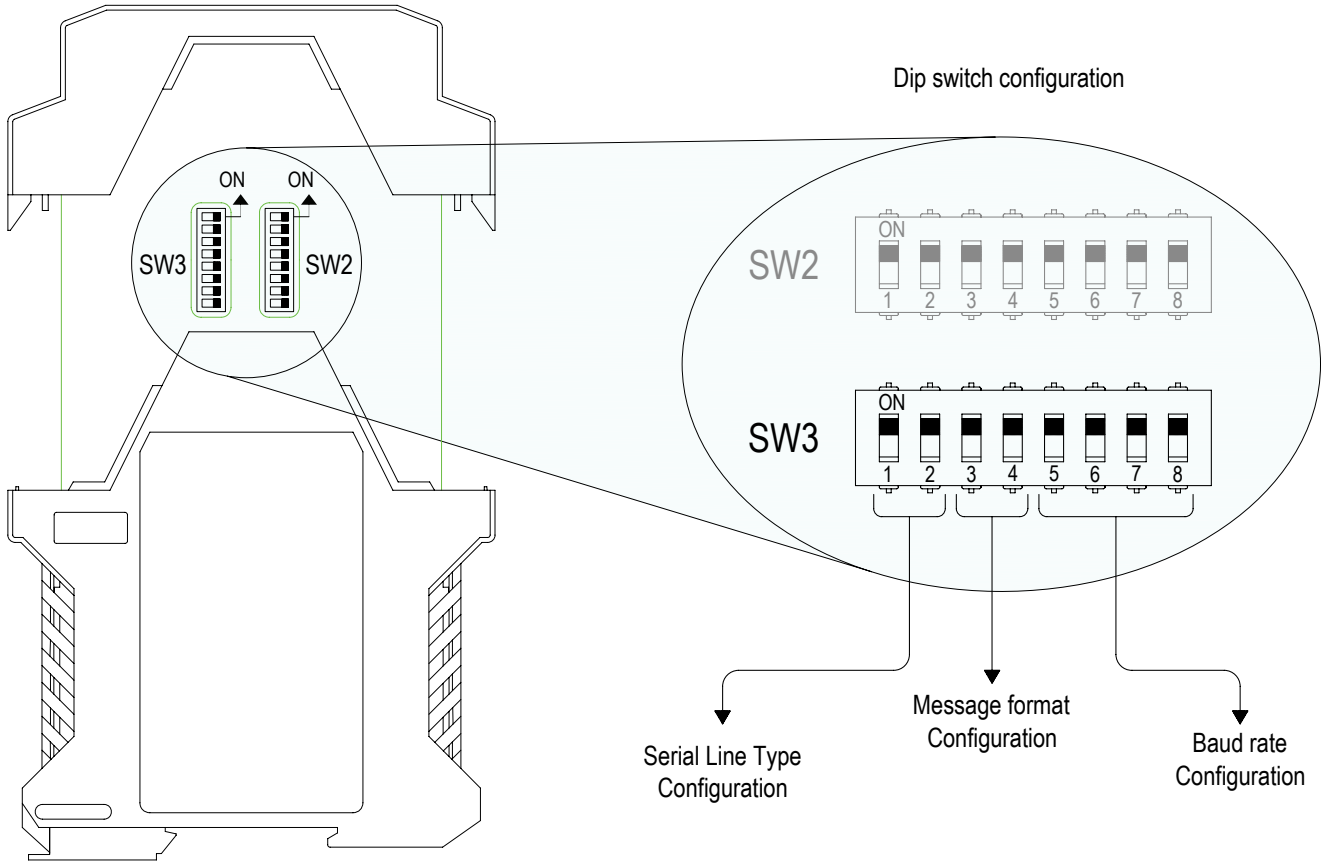


• **Serial Line Type Hardware Configuration**





Side A Panel View







• Serial Line Type Configuration

Hazardous Area Serial Line	Safe Area Serial Line	SW1	SW2
RS422	RS422 or RS232	<input checked="" type="checkbox"/> ON	<input checked="" type="checkbox"/> ON
RS422	RS485	<input type="checkbox"/> OFF	<input checked="" type="checkbox"/> ON
RS485	RS422 or RS232	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> OFF
RS485	RS485	<input type="checkbox"/> OFF	<input type="checkbox"/> OFF

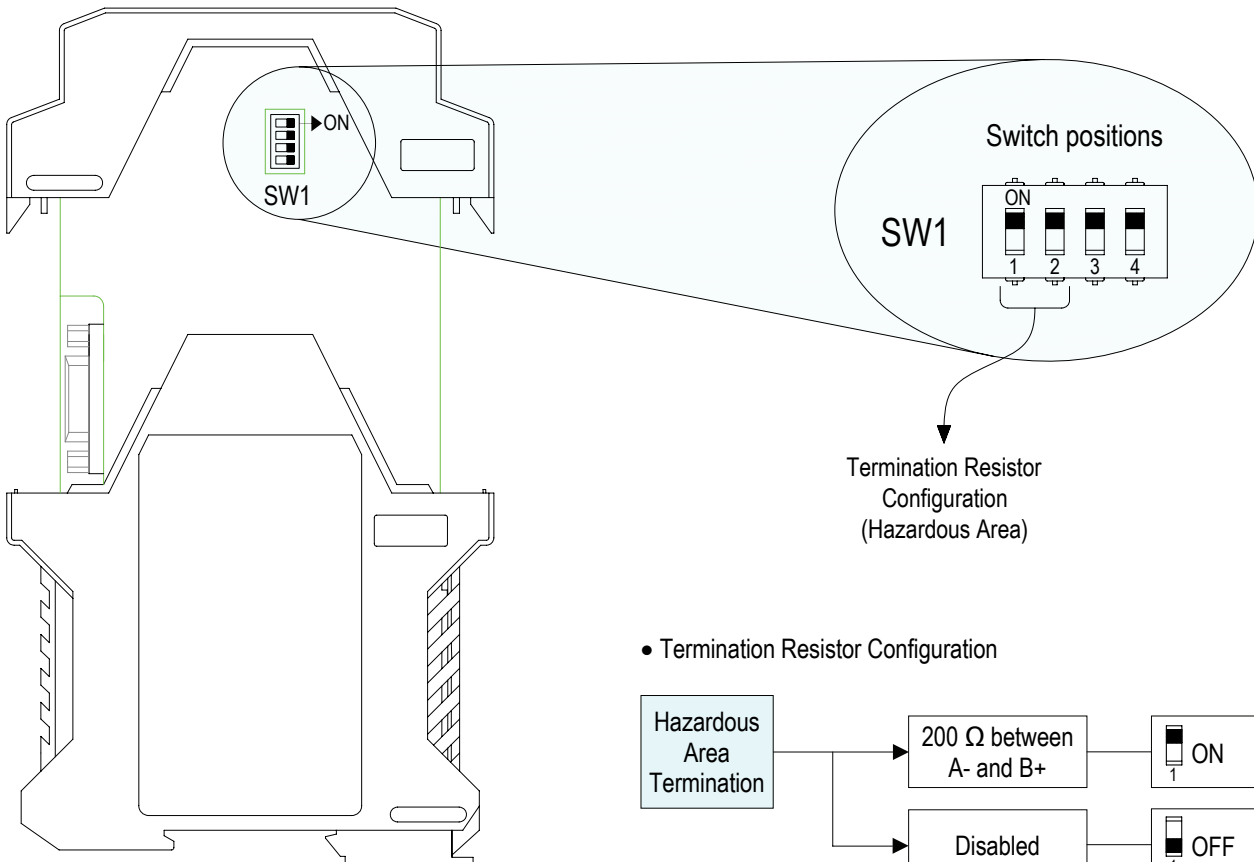
• Message format Configuration

Bit Frame Structure	Total # bit	SW3	SW4
7 data bit, no parity, 1 stop bit	9	<input type="checkbox"/> OFF	<input type="checkbox"/> OFF
7 data bit, no parity, 2 stop bit	10	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> OFF
7 data bit, odd parity, 1 stop bit	10	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> OFF
7 data bit, even parity, 1 stop bit	10	<input type="checkbox"/> OFF	<input type="checkbox"/> OFF
8 data bit, no parity, 1 stop bit	10	<input type="checkbox"/> OFF	<input type="checkbox"/> OFF
7 data bit, odd parity, 2 stop bit	11	<input type="checkbox"/> OFF	<input type="checkbox"/> ON
7 data bit, even parity, 2 stop bit	11	<input type="checkbox"/> OFF	<input type="checkbox"/> ON
8 data bit, no parity, 2 stop bit	11	<input type="checkbox"/> OFF	<input type="checkbox"/> ON
8 data bit, odd parity, 1 stop bit	11	<input type="checkbox"/> OFF	<input type="checkbox"/> ON
8 data bit, even parity, 1 stop bit	11	<input type="checkbox"/> OFF	<input type="checkbox"/> ON
8 data bit, odd parity, 2 stop bit	12	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> ON
8 data bit, even parity, 2 stop bit	12	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> ON

• Baud rate Configuration

Baud Rate	 5	 6	 7	 8
1.500.000	OFF	OFF	OFF	OFF
1.000.000	OFF	OFF	OFF	ON
750.000	OFF	OFF	ON	OFF
500.000	OFF	OFF	ON	ON
375.000	OFF	ON	OFF	OFF
187.500	OFF	ON	OFF	ON
93.750	OFF	ON	ON	OFF
115.200	OFF	ON	ON	ON
57.600	ON	OFF	OFF	OFF
38.400	ON	OFF	OFF	ON
19.200	ON	OFF	ON	OFF
14.400	ON	OFF	ON	ON
9.600	ON	ON	OFF	OFF
4.800	ON	ON	OFF	ON
2.400	ON	ON	ON	OFF
1.200	ON	ON	ON	ON

Side B Panel View



• Termination Resistor Configuration

