

## Warning

D1060 is an isolated Intrinsically Safe Associated Apparatus located in Non Hazardous Locations or 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 Locations (according to ANSI/ISA 12.12.01-13, UL60079-15, CSA-C22.2 No. 213-M1987, CAN/CSA C22.2 No. 60079-15:12) 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. When installed in Class I, Division 2 or Class I, Zone 2 Hazardous Locations, the module must be mounted in supplemental enclosure meeting at least IP54 degree protection. Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground.

D1060 must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards (e.g. 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 Locations or unless area is known to be nonhazardous.

**Warning: substitution of components may impair Intrinsic Safety and suitability for Division 2, Zone 2.**

**Avertissement: le remplacement des composants peut dégrader la Sécurité Intrinsèque et la conformité pour Div. 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.**

**Danger d'Explosion: pour prévenir une inflammation de l'atmosphère inflammable ou combustible, couper l'alimentation avant de réparer à moins de savoir que l'emplacement n'est pas dangereux.**

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 D1060 must be cleaned only with a damp or antistatic cloth.**

**Danger électrostatique: pour éviter le danger électrostatique, l'enveloppe de D1060 doit être nettoyée au moyen d'un chiffon humide ou antistatique.**

Any penetration of cleaning liquid must be avoided to prevent damage to the unit. 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.

If calibration requires the use of an adjustable power supply, current meter, or voltmeter, it should be only be performed when the area is known to be nonhazardous or with equipment suitable for the area classification.

## Technical Data

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

**Current consumption @ 24 V:** 60 mA with 20 mA output and transistors energized.

**Current consumption @ 12 V:** 110 mA with 20 mA output and transistors energized.

**Power dissipation:** 1.3 W with 24 V supply, 20 mA output and transistors energized.

**Max. power consumption:** at 30 V supply voltage, overload condition, transistors output energized and PPC1090 connected, 1.9 W.

**Isolation (Test Voltage):** I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV; Analog Out/Supply 500 V; Analog Out/Digitals Out 500 V; Digital Outs/Supply 500 V; Digital Out/Digitals Out 500 V;

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

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

**Switching current levels:** ON  $\geq 2.1$  mA, OFF  $\leq 1.2$  mA, switch current  $\approx 1.65$  mA  $\pm 0.2$  mA hysteresis (for proximity or transistor input).

**Equivalent source:** 8 V 1 K $\Omega$  typical (8 V no load, 8 mA short circuit).

**Integration Time:** 100 ms.

**Resolution/Visualization:** 1 mHz for 50 Hz range, 10 mHz for 500 Hz range, 100 mHz for 5 KHz range, 1 Hz for 50 KHz range.

**Input range:** 0 to 50.5 KHz maximum.

**Burnout:** downscale analog output signal for loss of input signal.

**Output:** 0/4 to 20 mA, on max. 600  $\Omega$  load source mode, current limited at 22 mA or 0/1 to 5 V or 0/2 to 10 V signal, limited at 11 V.

**Resolution:** 1  $\mu$ A current output or 1 mV voltage output.

**Transfer characteristic:** linear direct or reverse.

**Response time:**  $\leq 50$  ms (10 to 90 % step change).

**Output ripple:**  $\leq 20$  mVrms on 250  $\Omega$  load.

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

**Output factor:** direct 1:1 or divided by 10, 100, 1000, 10000, 100000 or 1000000.

**Open-collector rating:** 100 mA at 35 Vdc ( $\leq 1.5$  V voltage drop).

**Leakage current:**  $\leq 50$   $\mu$ A at 35 Vdc.

**Frequency response:** 50 KHz maximum.

**Alarm: Trip point range:** within rated limits of input range (see input for step resolution).

**Delay time:** 0 to 1000 s, 100 ms step.

**Hysteresis:** 0 to 5 Hz for 50 Hz range, 0 to 50 Hz for 500 Hz range, 0 to 500 Hz for 5 KHz range, 0 to 5 KHz for 50 KHz range (see input visualization parameters for step resolution).

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

**Open-collector rating:** 100 mA at 35 Vdc ( $\leq 1.5$  V voltage drop).

**Leakage current:**  $\leq 50$   $\mu$ A at 35 Vdc.

**Performance:** Ref. Conditions 24 V supply, 250  $\Omega$  load,  $23 \pm 1$  °C ambient temperature.

**Input:**

**Calibration and linearity accuracy:**  $\leq \pm 0.05$  % of full scale of selected input range.

**Temperature influence:**  $\leq \pm 0.005$  % of full scale input range for a 1 °C change.

**Analog Output:**

**Calibration accuracy:**  $\leq \pm 0.1$  % of full scale.

**Linearity error:**  $\leq \pm 0.05$  % of full scale.

**Supply voltage influence:**  $\leq \pm 0.05$  % of full scale for a min to max supply change.

**Load influence:**  $\leq \pm 0.05$  % of full scale for a 0 to 100 % load resistance change.

**Temperature influence:**  $\leq \pm 0.01$  % on zero and span for a 1 °C change.

**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:**

for use in Class I, Division 2, Groups A, B, C, D, Temperature Code T4; Class I, Zone 2, AEx nC [ia] IIC T4 and Class I, Zone 2, Ex nC [ia] IIC T4 Hazardous Locations.

Provides intrinsically safe circuits for use in Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 and Class I, Zone 0, Group IIC Hazardous Locations.

**Approvals:** UL & C-UL E222308 conforms to UL 913 (Div. 1, 8th Ed., Rev. 2013-12-06), UL 60079-0 (General, All Zones, 6th Ed.), UL 60079-11 (Intrinsic Safety "i" Zones 0 & 1, 6th Ed.), UL 60079-15 ("n" Zone 2, 4th Ed.), ANSI/ISA 12.12.01-2013 (Div. 2), UL 61010-1 (3rd Ed., Rev. 2012-05-11) for UL

and CAN/CSA-C22.2 No. 157-92 (Reaffirmed 2012, Div. 1), CAN CSA-C22.2 No. 60079-0:11 (General, All Zones), CAN/CSA-C22.2 No. 60079-11:14 (Intrinsic Safety "i" Zones 0 & 1),

CSA-C22.2 No. 213-M1987 (R2013, Div. 2), CAN/CSA-C22.2 No. 60079-15:12 ("n" Zone 2), CAN/CSA-C22.2 No. 61010-1-12 (3rd Ed.) for C-UL.

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

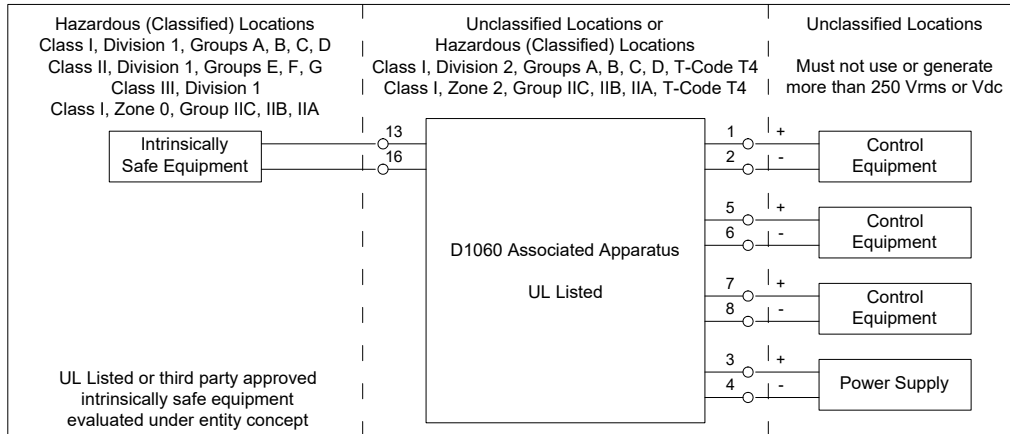
**Weight:** about 155 g.

**Connection:** by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm<sup>2</sup>.

**Location:** Non Hazardous Locations or 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.


**NOTE:**

when installed in Class I, Division 2 or Class I, Zone 2 Hazardous Locations, the module must be mounted in supplemental enclosure meeting at least IP54 degree protection.

This associated apparatus may also be connected to simple apparatus as defined in Article 504.2 and installed and temperature classified in accordance with article 504.10(B) of the National Electrical Code (ANSI/NFPA 70), or other local codes, as applicable.

This associated apparatus has not been evaluated for use in combination with another associated apparatus.

This associated apparatus provides galvanically isolated intrinsically safe circuits.

D1060 Terminals	Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
13 - 16	$U_o / V_{oc} = 10.9 \text{ V}$	$\leq$	$U_i / V_{max}$
	$I_o / I_{sc} = 1.1 \text{ mA}$	$\leq$	$I_i / I_{max}$
	$P_o / P_o = 3 \text{ mW}$	$\leq$	$P_i / P_i$

The output current of this associated apparatus is limited by a resistor such that the output voltage-current plot is straight line drawn between open-circuit voltage and short-circuit current.

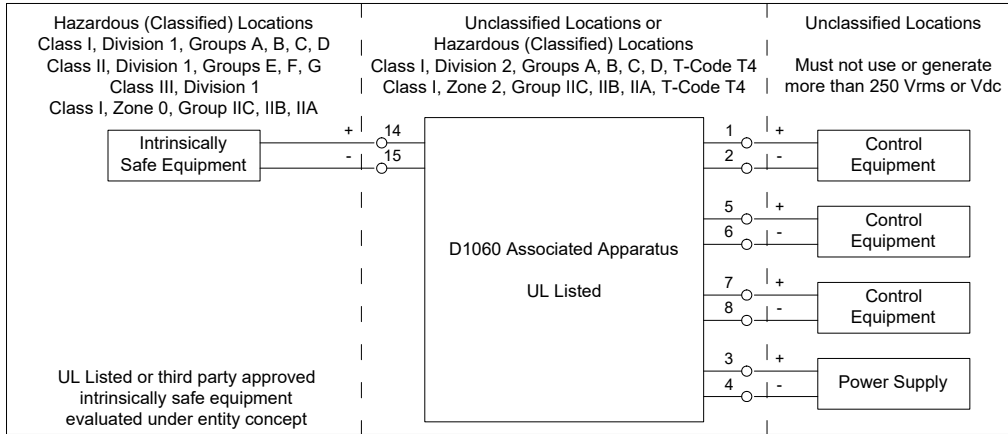
D1060 Terminals	Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
13 - 16	$U_i / V_{max} = 30 \text{ V}$	$\geq$	$U_o / V_{oc}$
	$C_i = 1.05 \text{ nF}$ $L_i = 0 \text{ nH}$		

**NOTE:**

when used with separate powered intrinsically safe devices, check that maximum allowable voltage ( $U_i/V_{max}$ ) of the D1060 Associated Apparatus are not exceeded by the safety parameters ( $U_o/V_{oc}$ ) of the Intrinsically Safe device.

D1060 Terminals	D1060 Associated Apparatus Parameters Zones (Divisions)	Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
13 - 16	$C_o / C_a = 2.05 \mu\text{F}$ $C_o / C_a = 14.4 \mu\text{F}$ $C_o / C_a = 63 \mu\text{F}$ $C_o / C_a = 14.4 \mu\text{F}$	IIC (A, B) IIB (C) IIA (D) (E, F, G)	$\geq$ $C_i / C_i \text{ device} + C \text{ cable}$
	$L_o / L_a = 29 \text{ H}$ $L_o / L_a = 117 \text{ H}$ $L_o / L_a = 235 \text{ H}$ $L_o / L_a = 117 \text{ H}$	IIC (A, B) IIB (C) IIA (D) (E, F, G)	$\geq$ $L_i / L_i \text{ device} + L \text{ cable}$
	$L_o / R_o = 12 \text{ mH}/\Omega$ $L_o / R_o = 48.1 \text{ mH}/\Omega$ $L_o / R_o = 96.2 \text{ mH}/\Omega$ $L_o / R_o = 48.1 \text{ mH}/\Omega$	IIC (A, B) IIB (C) IIA (D) (E, F, G)	$\geq$ $L_i / R_i \text{ device and } L \text{ cable} / R \text{ cable}$

**NOTE: 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  $L_i \text{ device} + L \text{ cable} \leq 50 \% \text{ of } L_o$ ).**  
The reduced capacitance of the external circuit (including cable) shall not be greater than 1uF for Groups I, IIA (Group D), IIB (Group C), and 600nF for Group IIC (Group A and B). Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in the entity parameters table.  
If the cable parameters are unknown, the following may be used:  
Capacitance 60pF per foot (180pF per meter),  
Inductance 0.20μH per foot (0.60μH per meter).


**NOTE:**

when installed in Class I, Division 2 or Class I, Zone 2 Hazardous Locations, the module must be mounted in supplemental enclosure meeting at least IP54 degree protection.

This associated apparatus may also be connected to simple apparatus as defined in Article 504.2 and installed and temperature classified in accordance with article 504.10(B) of the National Electrical Code (ANSI/NFPA 70), or other local codes, as applicable.

This associated apparatus has not been evaluated for use in combination with another associated apparatus.

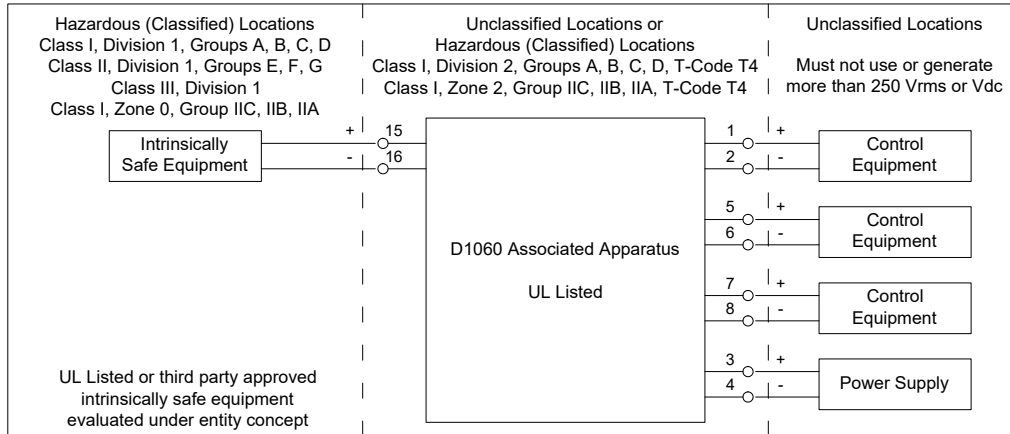
This associated apparatus provides galvanically isolated intrinsically safe circuits.

D1060 Terminals	Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
14 - 15	$U_o / V_{oc} = 15.5 \text{ V}$	$\leq$	$U_i / V_{max}$
	$I_o / I_{sc} = 13 \text{ mA}$	$\leq$	$I_i / I_{max}$
	$P_o / P_o = 48 \text{ mW}$	$\leq$	$P_i / P_i$

The output current of this associated apparatus is limited by a resistor such that the output voltage-current plot is straight line drawn between open-circuit voltage and short-circuit current.

D1060 Terminals	D1060 Associated Apparatus Parameters Zones (Divisions)	Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
14 - 15	$C_o / C_a = 508 \text{ nF}$ $C_o / C_a = 3.11 \text{ }\mu\text{F}$ $C_o / C_a = 12.5 \text{ }\mu\text{F}$ $C_o / C_a = 3.11 \text{ }\mu\text{F}$	$\geq$	$C_i / C_i \text{ device} + C \text{ cable}$
	$L_o / L_a = 235 \text{ mH}$ $L_o / L_a = 941 \text{ mH}$ $L_o / L_a = 1883 \text{ mH}$ $L_o / L_a = 941 \text{ mH}$	$\geq$	$L_i / L_i \text{ device} + L \text{ cable}$
	$R_o / R_o = 585 \text{ }\mu\text{H}/\Omega$ $R_o / R_o = 2342 \text{ }\mu\text{H}/\Omega$ $R_o / R_o = 4685 \text{ }\mu\text{H}/\Omega$ $R_o / R_o = 2342 \text{ }\mu\text{H}/\Omega$	$\geq$	$L_i / R_i \text{ device and } L \text{ cable} / R \text{ cable}$

**NOTE:** 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  $C_i \text{ device} + C \text{ cable} \leq 50 \%$  of  $C_o$  and  $L_i \text{ device} + L \text{ cable} \leq 50 \%$  of  $L_o$ ). The reduced capacitance of the external circuit (including cable) shall not be greater than 1 $\mu\text{F}$  for Groups I, IIA (Group D), IIB (Group C), and 600nF for Group IIC (Group A and B). Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in the entity parameters table. If the cable parameters are unknown, the following 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).


**NOTE:**

when installed in Class I, Division 2 or Class I, Zone 2 Hazardous Locations, the module must be mounted in supplemental enclosure meeting at least IP54 degree protection.

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This associated apparatus has not been evaluated for use in combination with another associated apparatus.

This associated apparatus provides galvanically isolated intrinsically safe circuits.

D1060 Terminals	Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
15 - 16	$U_o / V_{oc} = 10.9 \text{ V}$	$\leq$	$U_i / V_{max}$
	$I_o / I_{sc} = 23 \text{ mA}$	$\leq$	$I_i / I_{max}$
	$P_o / P_o = 60 \text{ mW}$	$\leq$	$P_i / P_i$

The output current of this associated apparatus is limited by a resistor such that the output voltage-current plot is straight line drawn between open-circuit voltage and short-circuit current.

D1060 Terminals	D1060 Associated Apparatus Parameters Zones (Divisions)		Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
15 - 16	$C_o / C_a = 2.05 \mu\text{F}$ $C_o / C_a = 14.40 \mu\text{F}$ $C_o / C_a = 63.00 \mu\text{F}$ $C_o / C_a = 14.40 \mu\text{F}$	IIC (A, B) IIB (C) IIA (D) (E, F, G)	$\geq$	$C_i / C_i \text{ device} + C \text{ cable}$
	$L_o / L_a = 72 \text{ mH}$ $L_o / L_a = 290 \text{ mH}$ $L_o / L_a = 580 \text{ mH}$ $L_o / L_a = 290 \text{ mH}$	IIC (A, B) IIB (C) IIA (D) (E, F, G)	$\geq$	$L_i / L_i \text{ device} + L \text{ cable}$
	$L_o / R_o = 594 \mu\text{H}/\Omega$ $L_o / R_o = 2378 \mu\text{H}/\Omega$ $L_o / R_o = 4757 \mu\text{H}/\Omega$ $L_o / R_o = 2378 \mu\text{H}/\Omega$	IIC (A, B) IIB (C) IIA (D) (E, F, G)	$\geq$	$L_i / R_i \text{ device and } L \text{ cable} / R \text{ cable}$

**NOTE:** 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  $L_i \text{ device} + L \text{ cable} \leq 50 \% \text{ of } L_o$ ). The reduced capacitance of the external circuit (including cable) shall not be greater than 1uF for Groups I, IIA (Group D), IIB (Group C), and 600nF for Group IIC (Group A and B). Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in the entity parameters table. If the cable parameters are unknown, the following may be used: Capacitance 60pF per foot (180pF per meter), Inductance 0.20μH per foot (0.60μH per meter).