

Hazardous Location Equipment - Canada

Equipment listed in this category for Hazardous Locations is also suitable for installations in areas that are non-hazardous locations and, unless referenced in the listing to another part of the Approval Guide, has been examined only for its hazardous location suitability .

The equipment is listed alphabetically, by manufacturer. Each model listing includes the specific ratings for which it is Approved.

Installation and maintenance of equipment listed in this category shall be according to the Canadian Electrical Code (CEC) or other applicable code. Two different Hazardous Location rating systems are defined by Section 18 and annex J of the CEC. The following are explanations of the two systems:

Hazardous Location Coding System - For Division.

Class I / II / III, Division 1 / 2

Type of Protection

XP	=	Explosionproof
IS	=	Intrinsically Safe Apparatus
AIS	=	Associated Apparatus with Intrinsically Safe Connections
PX, PY, PZ	=	Pressurized
APX, APY, APZ	=	Associated Pressurization Systems/Components
NI	=	An Apparatus which either does not contain sparking contact or sparking contact with nonincendive circuits.
NIFW	=	Apparatus with nonincendive field wiring
ANIFW	=	Associated nonincendive apparatus with nonincendive field wiring
NE	=	An Apparatus which contains sparking contacts protected by the mechanism or the enclosure.
DIP	=	Dust-protected (for use in Class II Division 1, or 2)
IPA	=	Apparatus suitable for use in Class I Division 1 or 2 not protected by one or more of the methods listed above

ANI	=	Associated Nonincendive Field Wiring Circuit
-----	---	--

Equipment utilizing more than one type of protection is shown by joining the applicable types of protection with hyphens, see Example 2.

Class

I	=	Class I
---	---	---------

II	=	Class II
----	---	----------

III	=	Class III
-----	---	-----------

Division

1	=	Division 1
---	---	------------

2	=	Division 2
---	---	------------

Group_

A	=	Group A
---	---	---------

B	=	Group B
---	---	---------

C	=	Group C
---	---	---------

D	=	Group D
---	---	---------

The chemical formula of a specific gas or vapor for which the apparatus is Approved may be shown alone or concatenated with an apparatus group.

E	=	Group E
---	---	---------

F	=	Group F
---	---	---------

G	=	Group G
---	---	---------

Temperature Class

T1	=	T1 (450°C)
----	---	---------------

T2	=	T2 (300°C)
----	---	---------------

T2A	=	T2A (280°C)
-----	---	----------------

T2B	=	T2B (260°C)
-----	---	----------------

T2C	=	T2C (230°C)
-----	---	----------------

T2D	=	T2D (215°C)
-----	---	----------------

T3	=	T3 (200°C)
T3A	=	T3A (180°C)
T3B	=	T3B (165°C)
T3C	=	T3C (160°C)
T4	=	T4 (135°C)
T4A	=	T4A (120°C)
T5	=	T5 (100°C)
T6	=	T6 (85°C)
XXX°C	=	XXX°C

The temperature class is based on a 40°C ambient unless a higher ambient is shown, e.g. "T4 Ta = 60°C".

A temperature class is not shown for associated apparatus designed to be located in an unclassified location.

For Class II and III locations, temperature classifications are not used by the CEC.

Control Documentation

When critical details for the installation are specified in a control drawing, instruction manual, installation diagram, etc. - the document number will be specified.

Entity

Intrinsically Safe apparatus Approved under the Entity concept shows the word "Entity" and may include the entity parameters in the Listing.

System

An Intrinsically Safe System is an assembly of interconnected apparatuses including an intrinsically safe apparatus, an associated apparatus and may include the interconnecting wiring.

FISCO

Intrinsically Safe apparatus Approved under the Fieldbus Intrinsically Safe Concept shows the word "FISCO" and may include the FISCO parameters in the Listing.

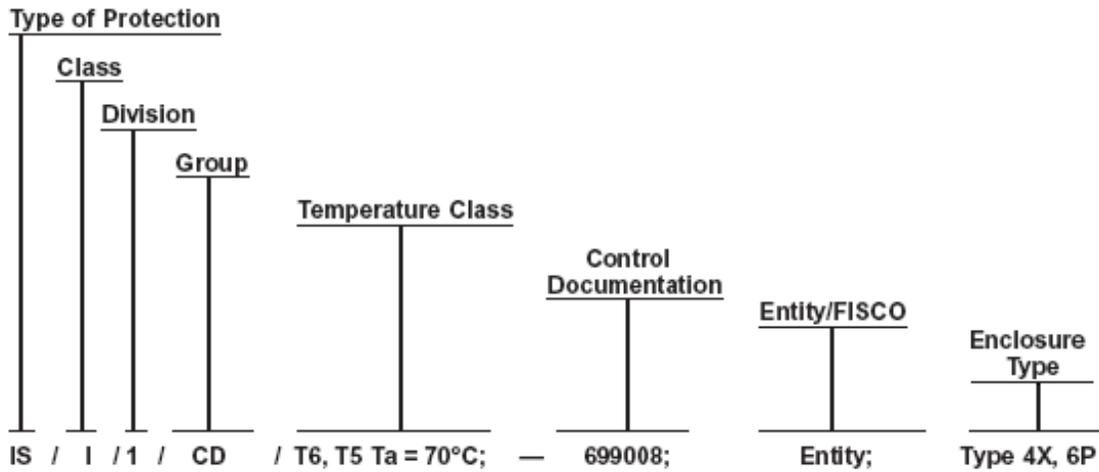
Enclosure Type

Enclosure type/ingress protection designation per CAN/CSA-C22.2 NO. 94 and/or CAN/CSA C22.2 No. 60529.

Special Conditions of Use

Some products, typically components, include *Special Conditions of Use* that must be observed when installing and using the product. The conditions are shown following each applicable Listing.

APPROVAL DESIGNATION



<p>Example 1</p>	<p>123-abc. Temperature Transmitter.</p> <p>IS / I / 1 / CD / T4 - 699007; Entity; Type 4X</p> <p>IS / II / 1 / EFG / - 699007; Entity; Type 4X</p> <p>Entity Parameters: V_{oc} = 18.4 V, I_{sc} = 33 mA, C_a = 0.9 μF, L_a = 110 mH</p>
<p>Example 2</p>	<p>456-def. Temperature Transmitter.</p> <p>XP-AIS / I / 1 / CD / T4 - 699008; Type 4X, IP66</p> <p>XP-AIS / I / 1 / IIB / T4 - 699008; Type 4X, IP66</p>
<p>Example 3</p>	<p>789-ghi. Temperature Transmitter.</p> <p>AIS / I,II,III / 1 / CDEFG - 699008; Type 12</p>

Example 4	a1b34-c Temperature Transmitter
	IPA / I / 2 / ABCD / T4 TA = 60°C; 98123; Type 4X
Example 5	a1b34-c Temperature Transmitter
	DIP / II / 1 / EFG

Hazardous Location Coding System for Zones.

Class I, Zone 0 / 1 / 2

Class		
I	=	Class I
[I]	=	Located in a nonhazardous location with connections for Class I
Zone		
0	=	Zone 0
1	=	Zone 1
2	=	Zone 2
[0/1/2]	=	Located in a nonhazardous location with connections for Zone 0/1/2
Explosion Protection		
Ex	=	Explosion Protected for Canada
AEx/Ex	=	Explosion Protected for the United States and Canada

Type of Protection		
d	=	Flameproof
e	=	Increased safety

ia	=	Intrinsic safety (Zone 0)
ib	=	Intrinsic safety (Zone 1)
[ia]	=	Associated apparatus with I.S. connections for Zone 0
[ib]	=	Associated apparatus with I.S. connections for Zone 1
m	=	Encapsulation
nA	=	Non-sparking apparatus
nC	=	Protected contacts
nR	=	Restricted breathing
nL	=	Energy Limited
o	=	Oil immersion
p	=	Pressurization
q	=	Powder filled

Equipment utilizing more than one type of protection is shown by adjacent codes for types of protection, see Examples 7 and 8.

"Division" apparatus with supplemental "Zone" marking as permitted by Section 505.9 (c) (2) of the NEC does NOT show an AEx "Type of Protection" designation, but does show the same "Type of Protection" prefix as the "Division" apparatus, see Example 2.

Group		
IIA	=	Group IIA
IIB	=	Group IIB Apparatus marked with Group IIB is also suitable for use in Group IIA.
IIC	=	Group IIC Apparatus marked with Group IIC is also suitable for use in Group IIB or IIA.

The chemical formula of a specific gas or vapor for which the apparatus is Approved may be shown alone or concatenated with an apparatus group - e.g. "H₂" or "IIB + H₂", see Example 7.

Temperature Class		
T1	=	T1 (450°C)
T2	=	T2 (300°C)
T3	=	T3 (200°C)
T4	=	T4 (135°C)
T5	=	T5 (100°C)
T6	=	T6 (85°C)
XXX°C	=	XXX°C

The temperature class is based on a 40°C ambient unless a higher ambient is shown, e.g. "T4 Ta = 60°C", see Example 4.

A temperature class is not shown for associated apparatus designed to be located in an unclassified location.

Control Documentation

When critical details for the installation are specified in a control drawing, instruction manual, installation diagram, etc - the document number will be specified.

Entity

Intrinsically Safe apparatus Approved under the Entity concept shows the word "Entity" and may include the entity parameters in the Listing.

FISCO

Intrinsically Safe apparatus Approved under the Fieldbus Intrinsically Safe Concept shows the word "FISCO" and may include the FISCO parameters in the Listing.

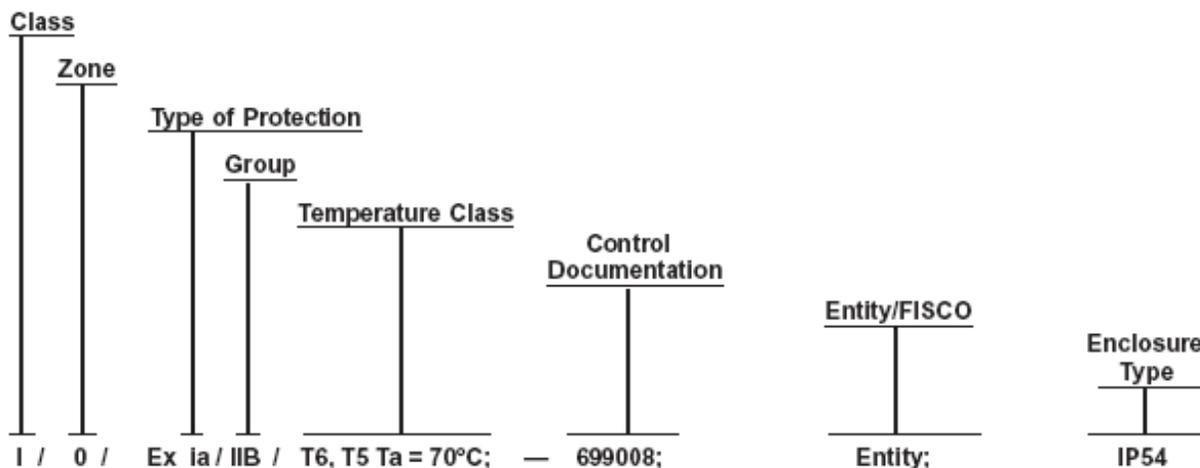
Enclosure Type

Enclosure type/ingress protection designation per CAN/CSA-C22.2 NO.94 and/or CAN/CSA C22.2 No. 60529.

Special Conditions of Use

Some products, typically components, include *Special Conditions of Use* that must be observed when installing and using the product. The conditions are shown following each applicable Listing.

APPROVAL DESIGNATION



Example 6	123-abc. Temperature Transmitter.
-----------	--

	I / 0 / Ex ia / IIB T4 - 699007; Entity; FISCO; Type 4X
	Entity Parameters: $V_{OC} = 18.4 \text{ V}$, $I_{SC} = 33 \text{ mA}$, $C_a = 0.9 \mu\text{F}$, $L_a = 110 \text{ mH}$
	FISCO Parameters: $V_{max} = 17.5$ V , $I_{max} =$ 380 mA , $P_i =$ 5.32 W , $C_i =$ $2,2 \text{ nF}$, $L_i = 7$ μH
Example 7	456-def. Temperature Transmitter.
	I / 1 / AEx d [ia] / IIB T4 - 699008; Type 4X, IP66
Example 8	789-ghi. Temperature Transmitter.
	I / 1 / Ex d [ia] / IIB + H ₂ T6; IP54
Example 9	1001-abc. Temperature Transmitter.
	[I / 0] Ex [ia] / IIB - 699008; Type 12

Class I, Division 1, Groups A, B, C & D

Class I, Division 1 locations are those in which hazardous concentrations of flammable gases or vapors exist continuously, intermittently or periodically under normal operating conditions. Electrical equipment for use in such locations may be "explosionproof," "intrinsically safe," "purged" or otherwise protected to meet the intent of Section 18 of the CEC.

Explosionproof protection consists of equipment designed to be capable of containing an internal explosion of a specified flammable vapor-air mixture. In addition, the equipment must operate at a safe temperature with respect to the surrounding atmosphere.

Intrinsically safe electrical equipment and associated wiring are incapable of releasing sufficient electrical or thermal energy to cause ignition of a specific hazardous material under "normal" or "fault" operating conditions. Normal operation assumes maximum supply voltage and rated environmental extremes; fault conditions assume any single or dual independent electrical faults plus field wiring open, shorts or connections to ground. Equipment rated as intrinsically safe is recognized by Section 18 as safe for use in hazardous locations without special enclosures or physical protection that would otherwise be required.

Purged systems have fresh air or an inert gas under positive pressure to exclude ignitable quantities of flammables from the electrical equipment enclosure.

Equipment Approved for Division 1 locations shall be permitted in Division 2 locations of the same class, group and temperature class and shall comply with (a) or (b) as applicable.

- (a) Intrinsically safe apparatus having a control drawing requiring the installation of associated apparatus for a Division 1 installation shall be permitted to be installed in a Division 2 location if the same associated apparatus is used for Division 2.
- (b) Equipment that is required to be explosionproof shall incorporate explosionproof conduit or cable seals when Division 2 wiring methods are employed.

Class I, Division 2, Groups A, B, C & D

Class I, Division 2 locations are those in which hazardous concentrations of flammables exist only under unlikely conditions of operation. As such, equipment and associated wiring which are incapable of releasing sufficient electrical and thermal energy to ignite flammable gases or vapors under "normal" operation and environmental conditions are safe to use in Class I, Division 2 locations.

Class I, Zone 0, Groups IIC, IIB & IIA

A Class I, Zone 0 location is a in which explosive gas atmospheres are present continuously or are present for long periods; Electrical apparatus for use in such locations may be type of protection "ia" Intrinsic Safety.

Class I, Zone 1, Groups IIC, IIB & IIA

A Class I, Zone 1 location is a location in which:

- (i) Explosive gas atmospheres are likely to occur in normal operation; or
- (ii) Explosive gas atmospheres may exist frequently because of repair or maintenance operations or because of leakage; or
- (iii) The location is adjacent to a Class I, Zone 0 location, from which explosive gas atmospheres could be communicated.

Electrical apparatus for use in such locations may be type of protection "d" Flameproof, "e" Increased Safety, "ib" Intrinsic Safety, "m" Encapsulation, "o" Oil Immersion, "p" Pressurized or "q" Powder-Filled.

Note: Electrical apparatus Approved for use in Class I, Zone 0 locations shall be permitted in Class I, Zone 1 locations of the same gas group and temperature class.

Class I, Zone 2, Groups IIC, IIB & IIA

A Class I, Zone 2 location is a location in which:

- (i) Explosive gas atmospheres are not likely to occur in normal operation and, if they do occur, they will exist for a short time only; or
- (ii) Flammable volatile liquids, flammable gases, or vapors are handled, processed, or used, but in which liquids, gases, or vapors are normally confined within closed containers or closed systems from which they can escape only as a result of accidental rupture or breakdown of the containers or systems or the abnormal operation of the equipment by which the liquids or gases are handled, processed, or used; or
- (iii) Explosive gas atmospheres are normally prevented by adequate ventilation but may occur as a result of failure or abnormal operation of the ventilation system; or
- (iv) The location is adjacent to a Class I, Zone 1 location from which explosive gas atmospheres could be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

Electrical apparatus for use in such locations may be type of protection "nA" Non-Sparking, "nC" Protected contacts, "nR" Restricted Breathing or "p" Pressurized.

Note: Electrical apparatus Approved for use in Class I, Zone 0 or Zone 1 locations shall be permitted in Class I, Zone 2 locations of the same gas group and temperature class.

Class II, Divisions 1 & 2, Groups E, F & G

Electrical equipment suitable for use in Class II locations, as defined by the CEC, is constructed to exclude ignitable amounts of dust from the equipment enclosure. Approved equipment of this type has also been evaluated to assure that hazardous surface temperatures do not exist. Equipment listed as suitable for Class II locations is "dust-ignitionproof" or otherwise designed to meet the intent of Section 18 of the CEC.

Class III, Divisions 1 & 2

Class III locations are those which are hazardous because of the presence of ignitable fibers or flyings. Equipment listed for installation in Class III locations is designed to exclude the fibers and flyings from the equipment enclosure and to function without developing excessive surface temperatures.

Entity Concept

Under entity requirements, the concept allows interconnection of intrinsically safe apparatus to associated apparatus, not specifically examined in such combination. The criteria for interconnection is that the maximum input voltage and current, which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal to or greater than the maximum output voltage and current levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum internal capacitance and inductance of the intrinsically safe apparatus, including interconnecting wiring, must be less than or equal to the maximum allowed capacitance and inductance which can be safely connected to the associated apparatus. If these criteria are met, then the combination may be connected and remain intrinsically safe.

FM Approvals defines the entity parameters as follows:

<i>Electrical Parameter</i>	<i>"Division"</i>	<i>"Zone"</i>
	<i>Apparatus (Traditional Canadian format)</i>	<i>Apparatus (IEC format)</i>
<i>For Associated Apparatus</i>		
Maximum output voltage	V_{oc}	U_o
Maximum output voltage - Multiple Channel Apparatus	V_t	U_o
Maximum output current	I_{sc}	I_o
Maximum output current - Multiple Channel Apparatus	I_t	I_o
Maximum allowed capacitance	C_a	C_o
Maximum allowed inductance	L_a	L_o
Maximum output power	P_o	P_o
External inductance-to-resistance ratio	L_a / R_a	L_o / R_o
<i>For Intrinsically safe apparatus</i>		
Maximum input voltage	V_{max}	U_i
Maximum input current	I_{max}	I_i
Maximum internal capacitance	C_i	C_i
Maximum internal inductance	L_i	L_i
Maximum input power	P_i	P_i
Internal inductance-to-resistance ratio	L_i / R_i	L_i / R_i

FISCO Concept

Under the FISCO concept the interconnection of Fieldbus Intrinsically Safe Apparatus to Associated Apparatus not specifically examined in such combination is allowed. The FISCO concept eliminates the need to calculate the cable parameters of the circuit. This is an alternative to the Entity Concept.

Nonincendive Field Wiring

Under the Nonincendive Field wiring concept, normal operation includes opening, shorting and grounding the field wiring. Apparatus Approved under this concept allows the installer to use wiring methods permitted for non-hazardous locations.

Enclosure Types

I. The following enclosure types are defined by CAN/CSA-C22.2 NO. 94-M91,

Enclosures for Electrical Equipment.

Type 1 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the

enclosed equipment and to provide a degree of protection against falling dirt.

Type 2 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt and to provide a degree of protection against dripping and light splashing of liquids.

Type 3 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow and windblown dust; and that will be undamaged by the external formation of ice on the enclosure.

Type 3R - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet and snow; and that will be undamaged by the external formation of ice on the enclosure.

Type 3S - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow and windblown dust; and in which the external mechanism(s) remain operable when ice laden.

Type 4 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

Type 4X - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water and corrosion; and that will be undamaged by the external formation of ice on the enclosure.

Type 5 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against settling airborne dust, lint, fibers and flyings; and to provide a degree of protection against dripping and light splashing of liquids.

Type 6 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

Type 6P - Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during prolonged submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

Type 12 - Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers and flyings; and against dripping and light splashing of liquids.

Type 12K - Enclosures constructed (with knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers and flyings; and against dripping and light splashing of liquids.

Type 13 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers and flyings; and against the spraying, splashing and seepage of water, oil and noncorrosive coolants.

II. The following "Ingress Protection" designations for enclosures are defined by CAN/CSA C22.2 No. 60529, *Degrees of Protection Provided by Enclosures*.

The ingress protection (IP) of an enclosure is designated by the letters "IP" followed by two arabic numerals.

First numeral (protection against solid bodies):

X	=	Protection not assessed
0	=	No protection.
1	=	Objects greater than 50 mm.
2	=	Objects greater than 12 mm.
3	=	Objects greater than 2.5 mm.
4	=	Objects greater than 1 mm.
5	=	Dust-protected.
6	=	Dust-tight.
Second numeral (protection against liquid):		
X	=	Protection not assessed

0	=	No protection
1	=	Vertically dripping water.
2	=	75° to 90° dripping water.
3	=	Sprayed water.
4	=	Splashed water.
5	=	Water jets.
6	=	Heavy seas.
7	=	Effects of immersion.
8	=	Indefinite immersion

Other

OGRE Séries

OGRE Séries Solar Modules.

NI / I / 2 / ABCD / T5Ta = -40°C to +90°C ; IP65

OGRE Series Solar Modules				
Model Description	Max Power	Nominal Voltage	Open Circuit Voc	Short Circuit Isc
OGRE P010-J12	10 Watts	12 V	21.7 Voc	0.62 Isc
OGRE P020-J12	20 Watts	12 V	21.7 Voc	1.21 Isc
OGRE P030-J12	30 Watts	12 V	21.7 Voc	1.85 Isc
OGRE P040-J12	40 Watts	12 V	21.7 Voc	2.47 Isc
OGRE B060-J12	60 Watts	12 V	20.3 Voc	3.99 Isc
OGRE B090-J12	90 Watts	12 V	20.4 Voc	5.92 Isc
OGRE B110-J12	110 Watts	12 V	19.4 Voc	7.66 Isc
OGRE B110-J24	110 Watts	24 V	38.7 Voc	3.83 Isc
OGRE B130-J12	130 Watts	12 V	24.1 Voc	7.11 Isc
OGRE B130-J24	130 Watts	24 V	48.2 Voc	3.56 Isc

Special Conditions of Use:

1) In Class I, Division 2 installations, the subject equipment shall be mounted within a tool-secured enclosure which is capable of accepting one or more of the Class I, Division 2 wiring methods specified in the Canadian Electrical Code (C22.1).

Company Name:	Off Grid Renewable Energy (OGRE)
Company Address:	4045 NW Expressway, Suite 500, Oklahoma City, Oklahoma 73116, USA
Company Website:	http://www.ogrenergy.com
Listing Country:	United States of America
Certification Type:	FM Approved - Canada
Hazardous Location Classification:	NI / I / 2 / ABCD / T5 Ta = -40°C to 90°C; Type IP65

