

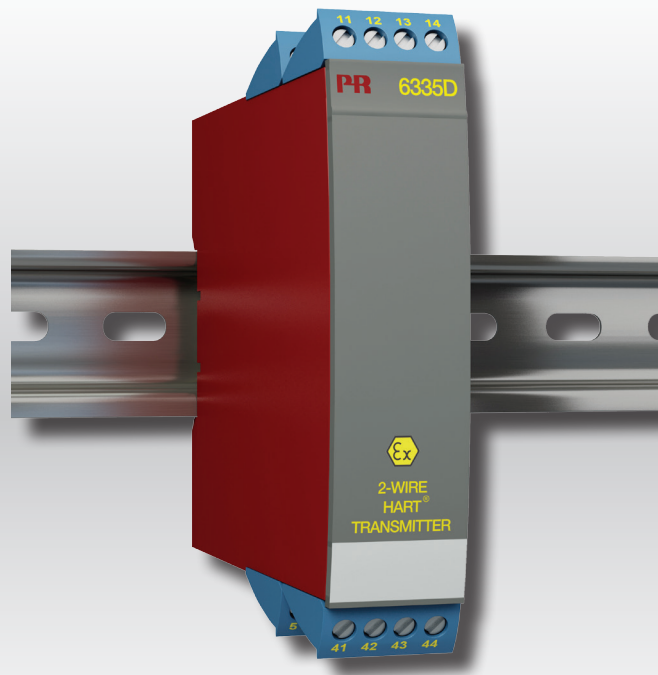


BURNS[®]
ENGINEERING

Product Manual

Burns T65 (PR 6335D2A)

2-wire HART transmitter



ATEX

IECEX

APPROVED

C US



EAC

CE

Burns FORM – 161222-E

No. 6335V111-UK

From serial no.: 150951186

PR
electronics

2-wire HART transmitter

Burns T65 (PR 6335D2A)

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2-wire HART transmitter

Burns T65 (PR 6335D2A)

- RTD, TC, Ohm, or mV input
- Extremely high measurement accuracy
- HART communication
- Galvanic isolation
- 1- or 2-channel version

Application

- Linearized temperature measurement with Pt100...Pt1000, Ni100...Ni1000, TC or sensor.
- Difference or average temperature measurement of 2 resistance or TC sensors.
- Conversion of linear resistance variation to a standard analog current signal, for instance from valves or Ohmic level sensors.
- Amplification of a bipolar mV signal to a standard 4...20 mA current signal.
- Connection of up to 15 channels to a digital 2-wire signal with HART communication.

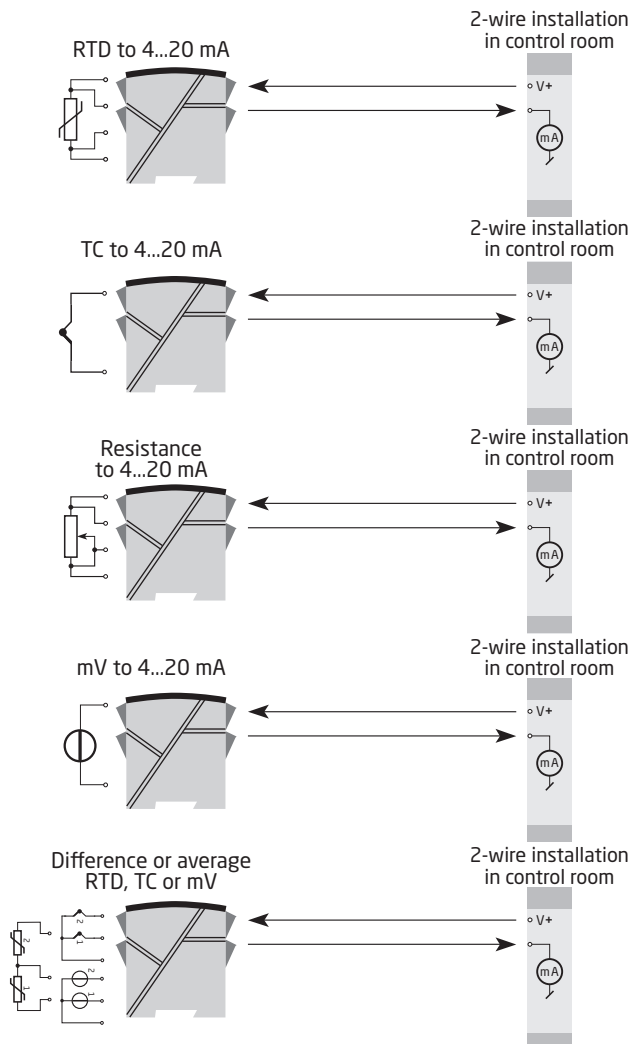
Technical characteristics

- Within a few seconds the user can program PR6335 to measure temperatures within all ranges defined by the norms.
- The RTD and resistance inputs have cable compensation for 2-, 3- and 4-wire connection.
- The 6335 has been designed according to strict safety requirements and is thus suitable for application in SIL 2 installations.
- A limit can be programmed on the output signal.
- Continuous check of vital stored data for safety reasons.
- Sensor error detection according to the guidelines in NAMUR NE 89.

Mounting / installation

- Mounted vertically or horizontally on a DIN rail. Using the 2-channel version up to 84 channels per metre can be mounted.
- The 6335D can be mounted in zone 0, 1, 2 and zone 20, 21, 22 including M1 / Class I/II/ III, Division 1, Groups A, B, C, D.

Applications



Model T65:

- Rail Mount Transmitter
- RTD & Thermocouple Capable
- HART® 5 Communication
- Hazardous Location Approvals:
 - ATEX, IECEx, FM, CSA

Electrical specifications

Environmental conditions:

Specification range:	-40°C to +85°C
Storage temperature	-40°C to +85°C
Calibration temperature.	20...28°
Humidity.	< 95% RH (non-cond.)
Protection degree	IP20

Mechanical specifications:

Dimensions (H x W x D)	109 x 23.5 x 104 mm
Weight (1 / 2 channels)	145 / 185 g
DIN rail type.	DIN EN/IEC 60715 - 35 mm
Wire size.	0.13...2.08 mm ² / AWG 26...14 stranded wire
Screw terminal torque.	0.5 Nm

Common specifications:

Supply voltage, DC	
Standard.	8.0...35 VDC
ATEX, CSA, FM & IECEx	8.0...30 VDC
Internal consumption	0.19...0.8 W
Voltage drop	8.0 VDC
Isolation voltage, test / operation.	1.5 kVAC / 50 VAC
Warm-up time.	30 s
Communications interface	Loop Link & HART
Signal / noise ratio.	Min. 60 dB
Response time (programmable)	1...60 s
EEPROM error check	< 10 s
Signal dynamics, input	22 bit
Signal dynamics, output	16 bit
Effect of supply voltage variation.	< 0.005% of span / VDC

Accuracy, the greater of general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	$\leq \pm 0.05\%$ of span	$\leq \pm 0.005\%$ of span / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
Pt100 / Pt1000	$\leq \pm 0.1^\circ\text{C}$	$\leq \pm 0.005^\circ\text{C}/^\circ\text{C}$
Ni100	$\leq \pm 0.2^\circ\text{C}$	$\leq \pm 0.005^\circ\text{C}/^\circ\text{C}$
Lin. R	$\leq \pm 0.1 \Omega$	$\leq \pm 5 \text{ mW} / ^\circ\text{C}$
Volt	$\leq \pm 10 \mu\text{V}$	$\leq \pm 0.5 \mu\text{V} / ^\circ\text{C}$
TC type: E, J, K, L, N, T, U	$\leq \pm 0.5^\circ\text{C}$	$\leq \pm 0.025^\circ\text{C} / ^\circ\text{C}$
TC type: B, R, S, W3, W5	$\leq \pm 1^\circ\text{C}$	$\leq \pm 0.1^\circ\text{C} / ^\circ\text{C}$

EMC - immunity influence.	$< \pm 0.1\%$ of span
Extended EMC immunity: NAMUR NE 21, A criterion, burst	$< \pm 1\%$ of span

Electrical specifications, inputs:

Max. offset 50% of selected numerical max. value

RTD and linear resistance input:

RTD type	Min. value	Max. value	Min. span	Standard
Pt100	-200°C	+850°C	10°C	IEC 60751
Ni100	-60°C	+250°C	10°C	DIN 43760
Lin. R	0 Ω	7000 Ω	25 Ω	-----

Cable resistance per wire (max.). 5 Ω

(up to 50 Ω per wire is possible with reduced measurement accuracy)

Sensor current Nom. 0.2 mA

Effect of sensor cable resistance (3- / 4-wire) $< 0.002 \Omega/\Omega$

Sensor error detection Yes

Short circuit detection. If 0% > 30 Ω

TC inputs:

Type	Min. temperature	Max. temperature	Min. span	Standard
B	+400°C	+1820°C	100°C	IEC584
E	-100°C	+1000°C	50°C	IEC584
J	-100°C	+1200°C	50°C	IEC584
K	-180°C	+1372°C	50°C	IEC584
L	-100°C	+900°C	50°C	DIN 43710
N	-180°C	+1300°C	50°C	IEC584
R	-50°C	+1760°C	100°C	IEC584
S	-50°C	+1760°C	100°C	IEC584
T	-200°C	+400°C	50°C	IEC584
U	-200°C	+600°C	50°C	DIN 43710
W3	0°C	+2300°C	100°C	ASTM E988-90
W5	0°	+2300°C	100°C	ASTM E988-90

Cold junction compensation < ±1.0°C
 External CJC with Ni100 or Pt100 -40 ≤ T_{amb.} ≤ 135°C
 Sensor error detection Yes
 Sensor error current:
 When detecting Nom. 33 µA
 Else. 0 µA
 Short circuit detection. No

Voltage inputs:

Measurement range -800...+800 mV
 Min. span 2.5 mV
 Input resistance 10 MΩ

Output:**Current output:**

Signal range. 4...20 mA
 Min. signal range.. 16 mA
 Updating time 440 ms
 (660 ms for diff.)
 Fixed output signal Between 4 and 20 mA
 Output signal at EEprom error ≤ 3.5 mA
 Load resistance. ≤ (V_{supply} - 8.0) / 0.023 [Ω]
 Load stability < ±0.01% of span / 100 Ω

Sensor error detection:

Programmable 3.5...23 mA
 (shorted sensor error detection is ignored at TC and mV input)
 NAMUR NE43 Upscale 23 mA
 NAMUR NE43 Downscale. 3.5 mA

Of span = Of the presently selected range

Approvals:

EMC 2004/108/EC. EN 61326-1
 EAC TR-CU 020/2011. EN 61326-1

Ex / I.S.:

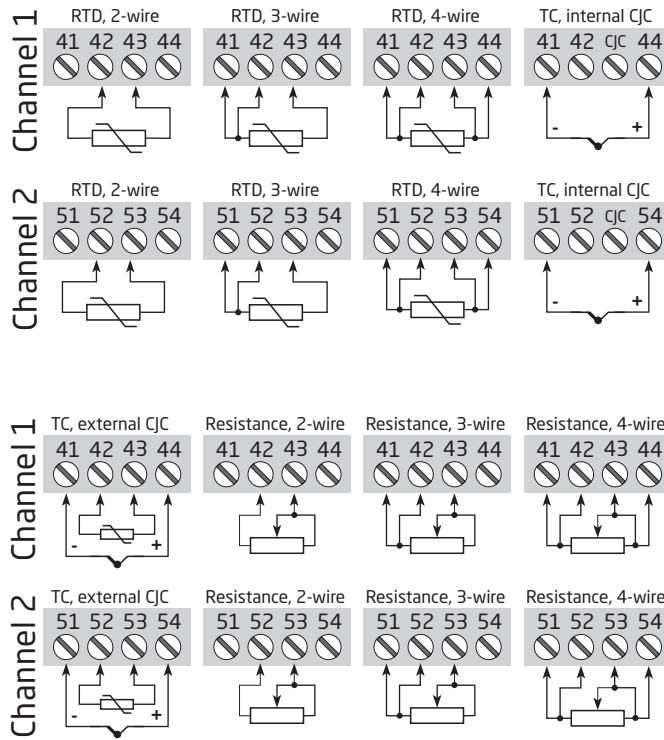
ATEX 94/9/EC KEMA 09ATEX0148 X
 IECEx. IECEx KEM 10.0084 X
 CSA 1125003
 FM 2D5A7
 EAC Ex TR-CU 012/2011. RU C-DK.GB08.V.00410

Functional safety:

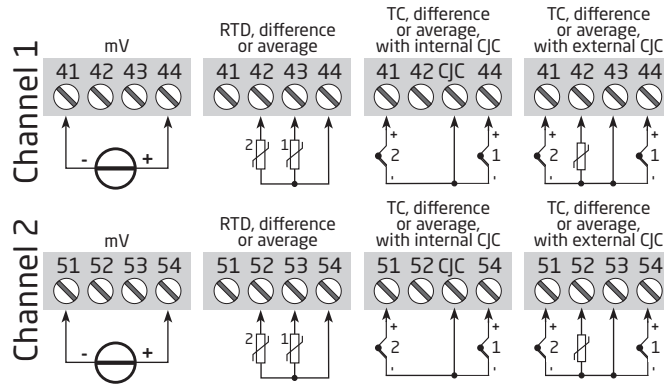
Hardware assessed for use in SIL applications
 FMEDA-report - www.prelectronics.com

Connections

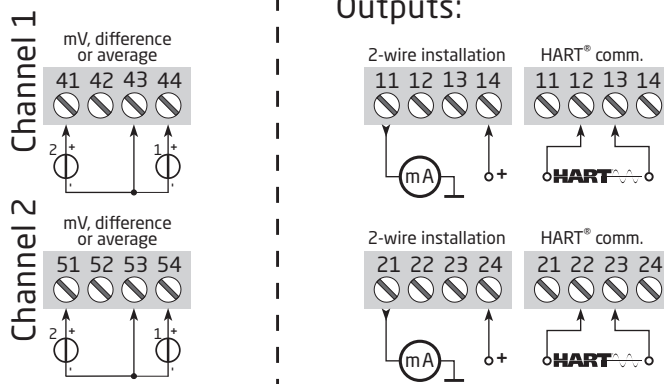
Inputs:



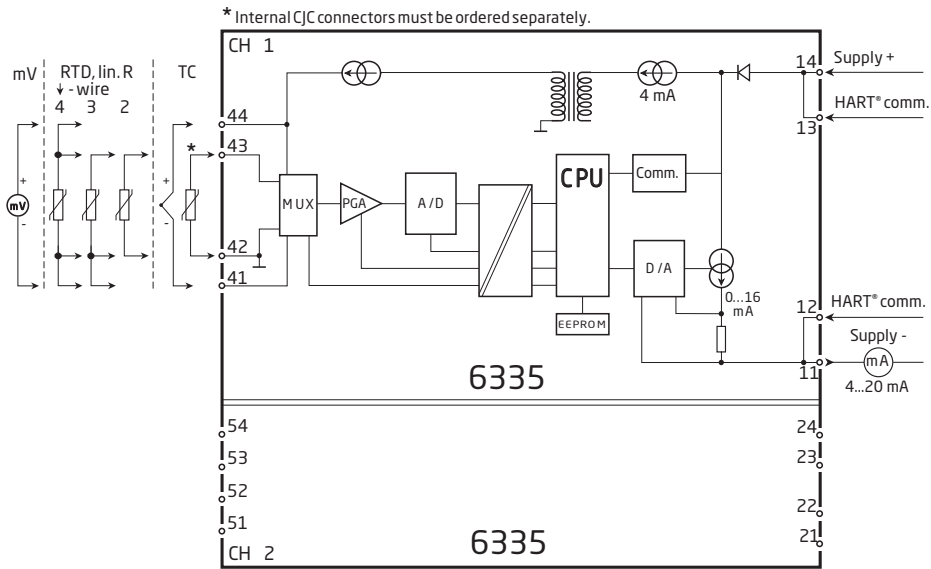
Inputs:



Outputs:



Block diagram



Programming

6335 can be configured in the following 3 ways:

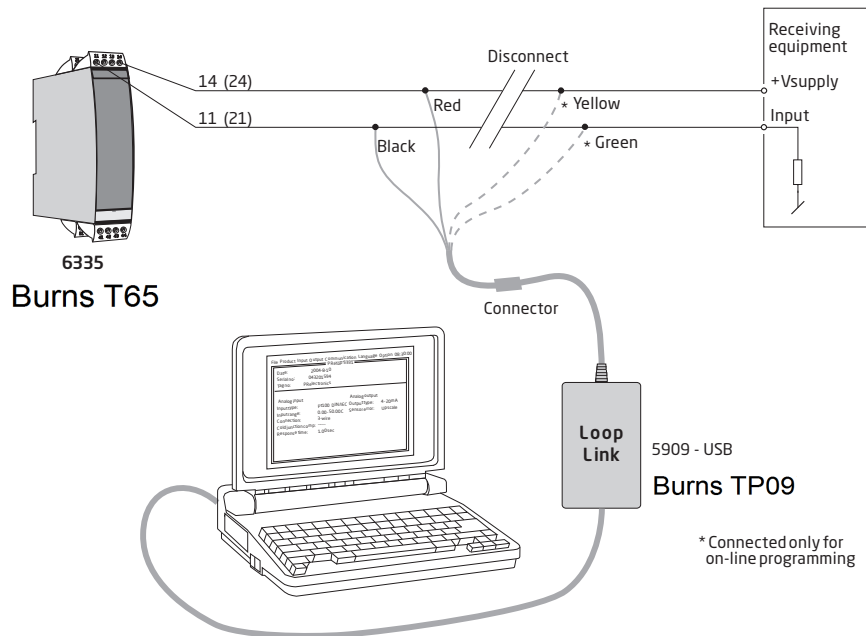
1. With PR electronics A/S' communications interface Loop Link and PRreset PC configuration software.
2. With a HART modem and PRreset PC configuration software.
3. With a HART communicator with PR electronics A/S' DDL driver.

1: Loop Link

For programming please refer to the drawing below and the help functions in PRreset.

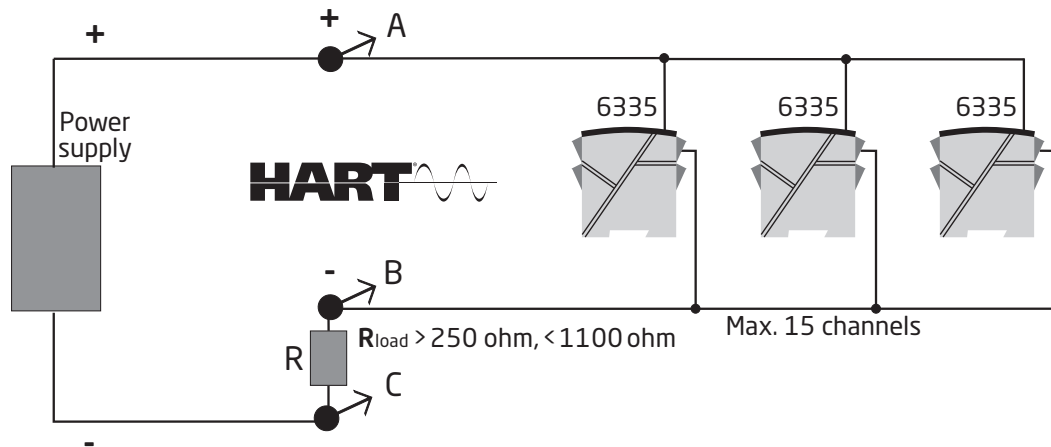
When communicating with non-installed devices, connectors 11, 12, 13, 14 (channel 1) and 21, 22, 23, 24 (channel 2) can be dismantled in the safe area to connect the terminals of the communications interface to the pins.

Loop Link is not approved for communication with devices installed in hazardous (Ex) area.



Connection of transmitters in multidrop mode

- The HART communicator or a PC modem can be connected across AB or BC.



- The outputs of max. 15 transmitters can be connected in parallel for a digital HART communication on 2-wires.
- Before it is connected, each transmitter must be configured with a unique number from 1 to 15. If 2 transmitters are configured with the same number, both will be excluded. The transmitters must be programmed for multidrop mode (with a fixed output signal of 4 mA). Maximum current in the loop is therefore 60 mA.
- The communication is either by means of a HART communicator or a HART modem.
- The PReset PC configuration software can configure the individual transmitter for multidrop mode and provide it with a unique polling address.

ATEX Installation drawing



For safe installation of 6335D or 6337D the following must be observed. The module shall only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area.

Year of manufacture can be taken from the first two digits in the serial number.

ATEX Certificate KEMA 09ATEX 0148 X

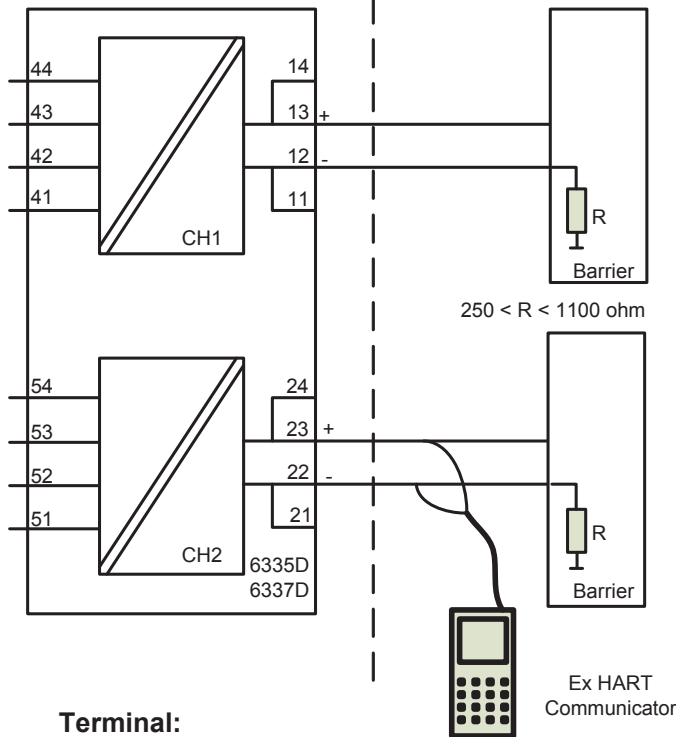
Marking II 1G Ex ia IIC T6..T4 Ga
 II 1D Ex ia IIIC Da
 I M 1 Ex ia I Ma

Standards EN60079-0:2012, EN60079-11:2012, EN60079-26:2007

Hazardous area Zone 0, 1, 2, 20, 21, 22	T4: $-40 \leq T_a \leq 85^\circ\text{C}$	Non Hazardous Area
	T5: $-40 \leq T_a \leq 60^\circ\text{C}$	
	T6: $-40 \leq T_a \leq 40^\circ\text{C}$	

**Terminal:
41,42,43,44**
 Uo: 9.6 VDC
 Io: 28 mA
 Po: 67.2 mW
 Lo: 35 mH
 Co: 3.5µF

**Terminal:
51,52,53,54**
 Uo: 9.6 VDC
 Io: 28 mA
 Po: 67.2 mW
 Lo: 35 mH
 Co: 3.5µF



**Terminal:
11,12,13,14 and
21,22,23,24**
 Ui: 30 VDC
 Ii: 120 mA
 Pi: 0.84 W
 Li: 10µH
 Ci: 1.0nF

General installation instructions

To avoid risk of ignition during installation and maintenance appropriate safety measures against electrostatic discharge (ESD) are to be considered.

The sensor circuit is not infallibly galvanic isolated from the supply output circuit. However, the galvanic isolation between the circuits is capable of withstanding a test voltage of 500Vac during 1 minute.

For installation in a potentially explosive gas atmosphere the following instructions apply:

To avoid risk of ignition due to electrostatic discharge (ESD) the transmitter shall be mounted in an enclosure providing a degree of protection of at least IP20 according to EN/IEC 60529.

Ambient temperature range:

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$

T5: $-40 \leq T_a \leq 60^{\circ}\text{C}$

T6: $-40 \leq T_a \leq 40^{\circ}\text{C}$

For installation in a potentially explosive dust atmosphere, the following instructions apply:

The transmitter shall be mounted in a metal enclosure or equivalent that is providing a degree of protection of at least IP6X according to EN/IEC 60529 that is suitable for the application and correctly installed. Cable entries and blanking elements shall be used that are suitable for the application and correctly installed. The surface temperature of the enclosure is equal to the ambient temperature +20K for a dust layer with a maximum thickness of 5 mm.

Ambient temperature range:

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$

For installation in a potentially explosive atmosphere in mines, the following instructions apply:

The transmitter shall be mounted in an enclosure providing a degree of protection of at least IP6X according to EN/IEC 60529. Cable entries and blanking elements shall be used that are suitable for the application and correctly installed.

Ambient temperature range:

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$

IECEX Installation drawing



For safe installation of 6335D or 6337D the following must be observed. The module shall only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area.

Year of manufacture can be taken from the first two digits in the serial number.

IECEX Certificate	IECEX KEM.10.0084X
Marking	Ex ia IIC T6..T4 Ga Ex ia IIIC Da Ex ia I Ma
Standards:	IEC60079-0:2011, IEC60079-11: 2011, IEC60079-26:2006

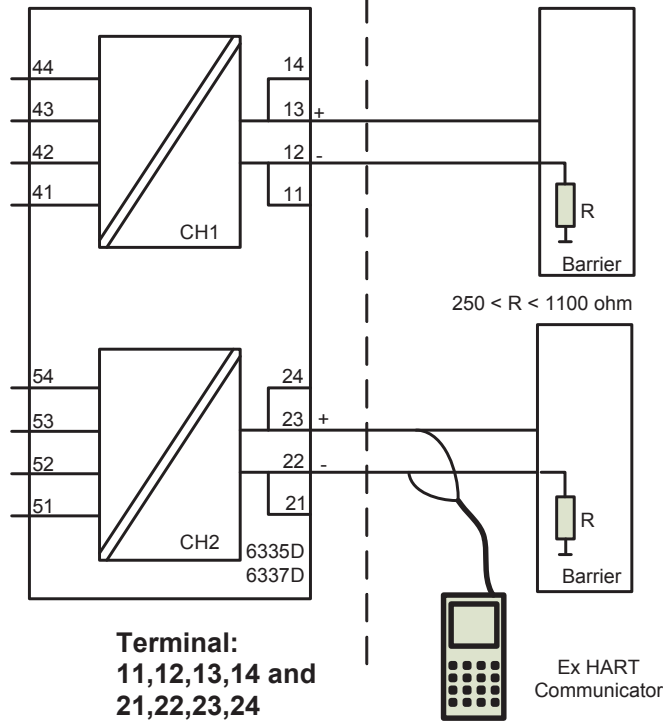
Hazardous area
Zone 0, 1, 2, 20, 21, 22

T4: $-40 \leq T_a \leq 85^\circ\text{C}$
T5: $-40 \leq T_a \leq 60^\circ\text{C}$
T6: $-40 \leq T_a \leq 40^\circ\text{C}$

Non Hazardous Area

**Terminal:
41,42,43,44**
U_o: 9.6 VDC
I_o: 28 mA
P_o: 67.2 mW
L_o: 35 mH
C_o: 3.5 μF

**Terminal:
51,52,53,54**
U_o: 9.6 VDC
I_o: 28 mA
P_o: 67.2 mW
L_o: 35 mH
C_o: 3.5 μF



**Terminal:
11,12,13,14 and
21,22,23,24**
U_i: 30 VDC
I_i: 120 mA
P_i: 0.84 W
L_i: 10 μH
C_i: 1.0 nF

General installation instructions

To avoid risk of ignition during installation and maintenance appropriate safety measures against electrostatic discharge (ESD) are to be considered.

The sensor circuit is not infallibly galvanic isolated from the supply output circuit. However, the galvanic isolation between the circuits is capable of withstanding a test voltage of 500Vac during 1 minute.

For installation in a potentially explosive gas atmosphere the following instructions apply:

To avoid risk of ignition due to electrostatic discharge (ESD) the transmitter shall be mounted in an enclosure providing a degree of protection of at least IP20 according to EN/IEC 60529.

Ambient temperature range:

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$

T5: $-40 \leq T_a \leq 60^{\circ}\text{C}$

T6: $-40 \leq T_a \leq 40^{\circ}\text{C}$

For installation in a potentially explosive dust atmosphere, the following instructions apply:

The transmitter shall be mounted in a metal enclosure or equivalent that is providing a degree of protection of at least IP6X according to EN/IEC 60529 that is suitable for the application and correctly installed. Cable entries and blanking elements shall be used that are suitable for the application and correctly installed. The surface temperature of the enclosure is equal to the ambient temperature +20K for a dust layer with a maximum thickness of 5 mm.

Ambient temperature range:

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$

For installation in a potentially explosive atmosphere in mines, the following instructions apply:

The transmitter shall be mounted in an enclosure providing a degree of protection of at least IP6X according to EN/IEC 60529. Cable entries and blanking elements shall be used that are suitable for the application and correctly installed.

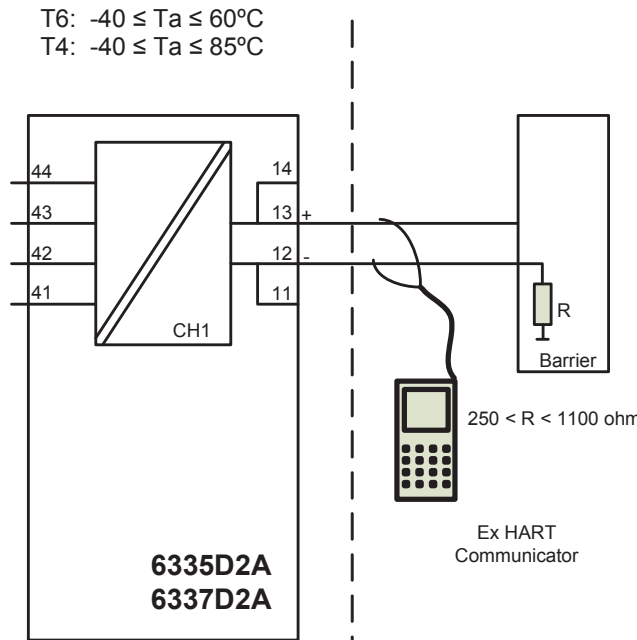
Ambient temperature range:

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$

Hazardous (Classified) Location
IS,Class I, Division 1, Group A,B,C,D T4..T6
Ex ia IIC T4..T6 Ga
Class I, Zone 0, AEx ia IIC T4..T6 Ga

Non Hazardous Location

Terminal:
41,42,43,44
Uo: 9.6 VDC
Io: 28 mA
Po: 67 mW
Lo: 35 mH
Co: 3.5 µF



Terminal:
11,12,13,14
Ui: 30 VDC
Ii: 120 mA
Pi: 0.84 W
Li: 10 µH
Ci: 1.0 nF

$Co(Ca) > \sum(Ci+C_{\text{cable}})$
 $Lo(La) > \sum(Li+L_{\text{cable}})$

Installation notes.

The Transmitter must be installed in a suitable enclosure to meet installation codes stipulated in The Canadian Electrical Code (CEC).

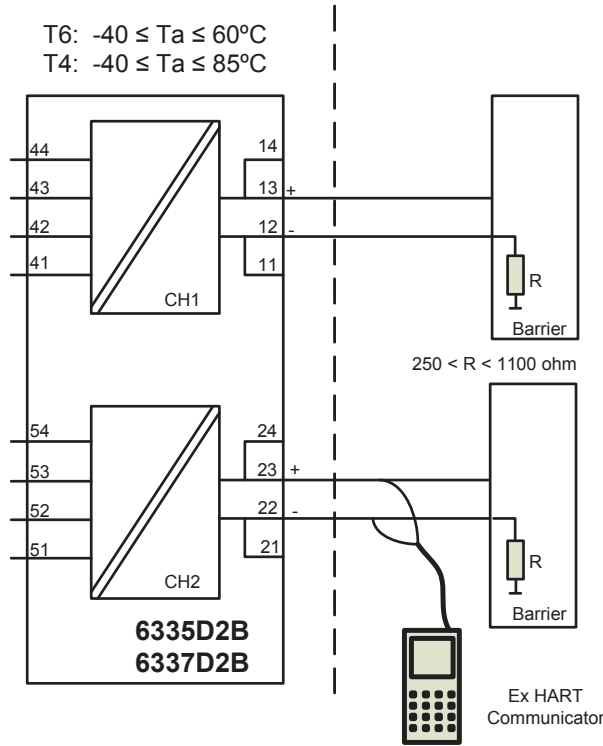
Substitution of components may impair intrinsic safety.

Hazardous (Classified) Location
IS,Class I, Division 1, Group A,B,C,D T4..T6
Ex ia IIC T4..T6 Ga
Class I, Zone 0, AEx ia IIC T4..T6 Ga

Non Hazardous Location

**Terminal:
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Uo: 9.6 VDC
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**Terminal:
51,52,53,54**
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**Terminal:
11,12,13,14 and
21,22,23,24**
Ui: 30 VDC
Ii: 120 mA
Pi: 0.84 W
Li: 10µH
Ci: 1.0nF

$Co(Ca) > \sum(Ci+Ccable)$
 $Lo(La) > \sum(Li+Lcable)$

Installation notes.

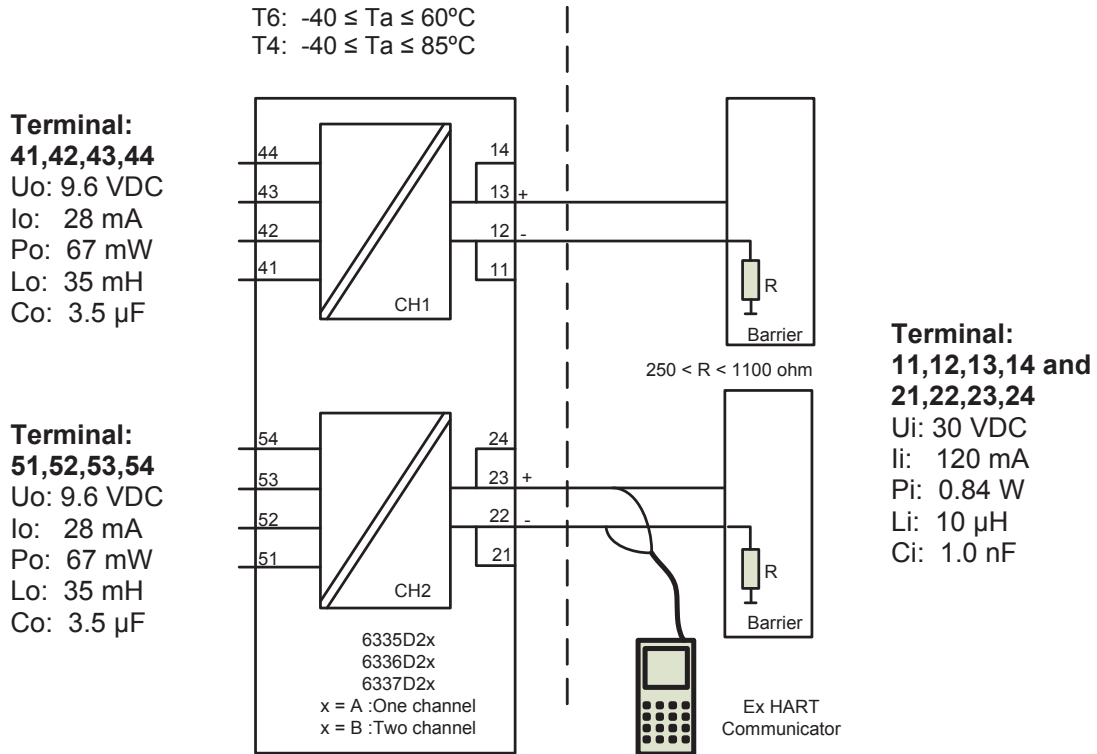
The Transmitter must be installed in a suitable enclosure to meet installation codes stipulated in The Canadian Electrical Code (CEC).

Channel 1 and Channel 2 are separate channels and therefore separate shielded cables shall be used for each channel.

Substitution of components may impair intrinsic safety.

Hazardous (Classified) Location
Class I, Division 1, Group A,B,C,D T4..T6
Class I, Zone 0, AEx ia IIC T4..T6

Non Hazardous Location



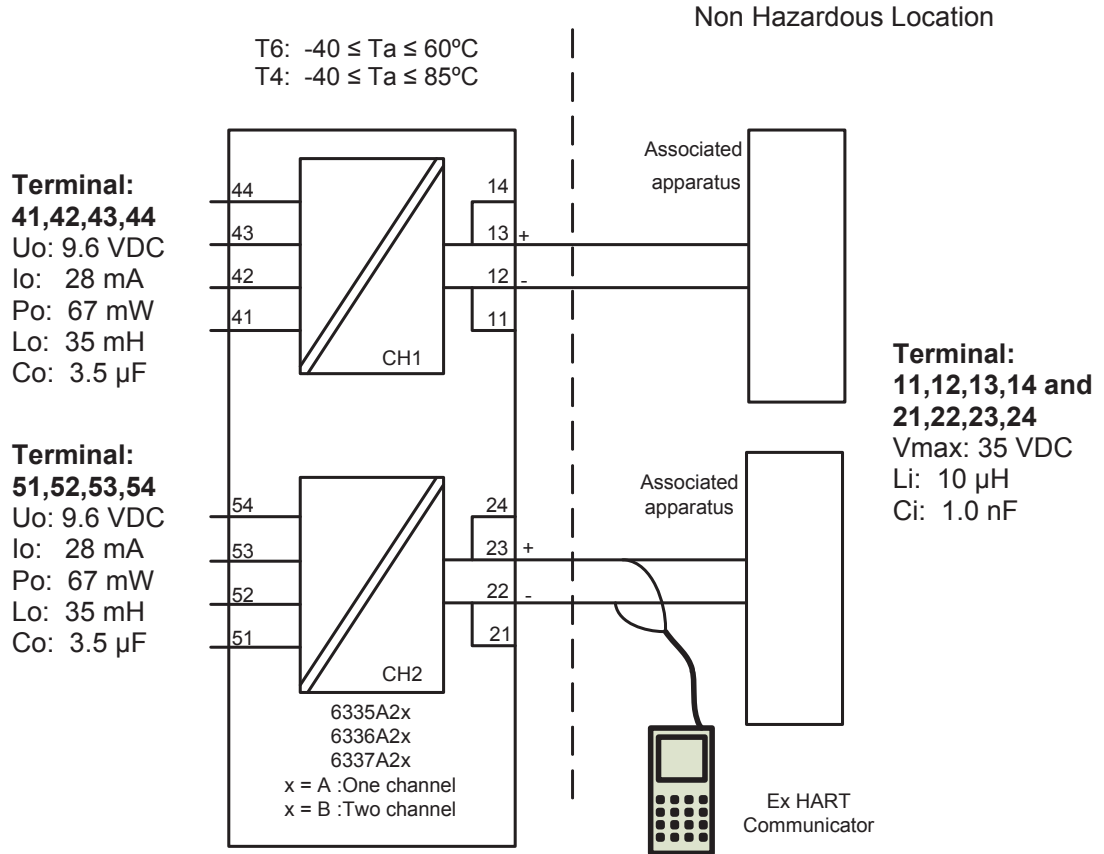
Installation notes

For installation in Class I the Transmitter must be installed in a suitable enclosure to meet installation codes stipulated in The National Electrical Code (ANSI-NFPA 70).

Equipment that is FM-approved for intrinsic safety may be connected to barriers based on the Entity Concept. This concept permits interconnection of approved transmitters, meters and other devices in combinations, which have not been specifically examined by FM, provided that the agency's criteria are met. The combination is then intrinsically safe, if the entity concept is acceptable to the authority having jurisdiction over the installation.

The entity concept criteria are as follows: The intrinsically safe devices, other than barriers, must not be a source of power. The maximum voltage $U_i(V_{MAX})$ and current $I_i(I_{MAX})$, and maximum power $P_i(P_{max})$, which the device can receive and remain intrinsically safe, must be equal to or greater than the voltage (U_o or V_{oc} or V_i) and current (I_o or I_{sc} or I_t) and the power P_o which can be delivered by the barrier. The sum of the maximum unprotected capacitance (C_i) for each intrinsically device and the interconnecting wiring must be less than the capacitance (C_a) which can be safely connected to the barrier. The sum of the maximum unprotected inductance (L_i) for each intrinsically device and the interconnecting wiring must be less than the inductance (L_a) which can be safely connected to the barrier. The entity parameters U_o , V_{oc} or V_i and I_o , I_{sc} or I_t , and C_a and L_a for barriers are provided by the barrier manufacturer.

Hazardous (Classified) Location
Class I, Division 2, Group A,B,C,D T4..T6
Class I, Zone 2, IIC T4..T6



Installation notes

The Transmitter must be installed in a suitable enclosure to meet installation codes stipulated in The National Electrical Code (ANSI-NFPA 70).

To assure a Non-Incendive system the transmitter and associated apparatus must be wired in accordance with the associated apparatus manufacturers field wiring instructions and the circuit diagram shown above.

Document history

The following list provides notes concerning revisions of this document.

Rev. ID	Date	Notes
111	15/50	ATEX & IECEx M1 approval added

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