

PR
electronics



BURNS[®]
ENGINEERING

Burns T51 (PR 5331D3B)

5 3 3 1

**2-Wire Programmable
Transmitter**

No. 5331V114-UK

From ser. no. 141365001



IECEX



CCOE

ATEX



ERC **CE**

Burns FORM-170316-A

Revision Notes

The following list provides notes concerning revisions of this document.

Rev. ID	Date	Notes
113	13/45	IECEX and INMETRO approvals added
114	15/10	PESO/CCOE approval added GOST approval replaced with EAC approval

**2-WIRE
PROGRAMMABLE TRANSMITTER**

Burns T51 (PR 5331D3B)

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2-WIRE PROGRAMMABLE TRANSMITTER

Burns T51 (PR 5331D3B)

- *RTD, TC, Ohm, or mV input*
- *Extremely high measurement accuracy*
- *1.5 kVAC galvanic isolation*
- *Programmable sensor error value*
- *For DIN form B sensor head mounting*

Application

- Linearised temperature measurement with Pt100...Pt1000, Ni100...Ni1000, or TC sensor.
- Conversion of linear resistance variation to a standard analogue current signal, for instance from valves or Ohmic level sensors.
- Amplification of a bipolar mV signal to a standard 4...20 mA current signal.

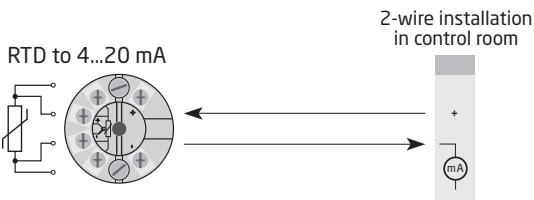
Technical characteristics

- Within a few seconds the user can program PR5331 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.
- Continuous check of vital stored data for safety reasons.

Mounting / installation

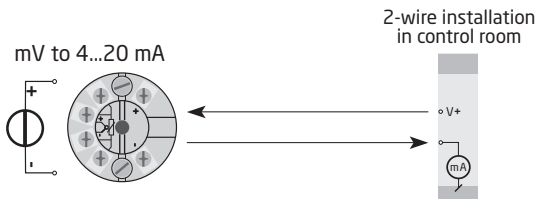
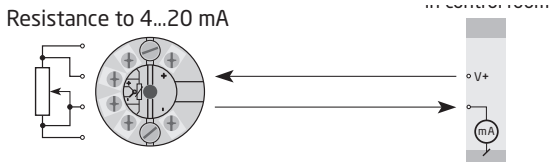
- For DIN form B sensor head mounting. In non-hazardous areas the 5331 can be mounted on a DIN rail with the PR fitting type 8421.

APPLICATIONS



Model T51:

- Head Mount Transmitter
- RTD & Thermocouple Capable
- Rail Mountable with item TT03
- Programmable
- Hazardous Location Approvals:
 - ATEX, IECEx, FM, CSA



Model T51:

- Head Mount Transmitter
- RTD & Thermocouple Capable
- Rail Mountable with item TT03
- Programmable
- Hazardous Location Approvals:
 - ATEX, IECEx, FM, CSA

Electrical specifications

Specifications range:

-40°C to +85°C

Common specifications:

Supply voltage, DC

Standard..... 7.2...35 V

CSA, FM, ATEX, IECEx & INMETRO..... 7.2...30 VDC

Internal consumption 25 mW...0.8 W

Voltage drop 7.2 VDC

Isolation voltage, test / operation..... 1.5 kVAC / 50 VAC

Warm-up time..... 5 min.

Communications interface Loop Link

Signal / noise ratio Min. 60 dB

Response time (programmable)..... 1...60 s

EEProm error check < 3.5 s

Signal dynamics, input..... 20 bit

Signal dynamics, output 16 bit

Calibration temperature 20...28°C

Accuracy, the greater of general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	≤ ±0.05% of span	≤ ±0.01% of span / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
RTD	$\leq \pm 0.2^{\circ}\text{C}$	$\leq \pm 0.01^{\circ}\text{C}/^{\circ}\text{C}$
Lin. R	$\leq \pm 0.1 \Omega$	$\leq \pm 10 \text{ m}\Omega / ^{\circ}\text{C}$
Volt	$\leq \pm 10 \mu\text{V}$	$\leq \pm 1 \mu\text{V} / ^{\circ}\text{C}$
TC type: E, J, K, L, N, T, U	$\leq \pm 1^{\circ}\text{C}$	$\leq \pm 0.05^{\circ}\text{C} / ^{\circ}\text{C}$
TC type: B, R, S, W3, W5, LR	$\leq \pm 2^{\circ}\text{C}$	$\leq \pm 0.2^{\circ}\text{C} / ^{\circ}\text{C}$

EMC immunity influence	$< \pm 0.5\%$ of span
Extended EMC immunity: NAMUR NE 21, A criterion, burst	$< \pm 1\%$ of span

Effect of supply voltage variation	$< 0.005\%$ of span / VDC
Vibration	IEC 60068-2-6 : 2007
2...25 Hz	$\pm 1.6 \text{ mm}$
25...100 Hz	$\pm 4 \text{ g}$
Max. wire size	1 x 1.5 mm ² stranded wire
Screw terminal torque	0.4 Nm
Humidity	$< 95\%$ RH (non-cond.)
Dimensions	$\varnothing 44 \times 20.2 \text{ mm}$
Protection degree (enclosure / terminal)	IP68 / IP00
Weight	50 g

Electrical specifications, input:

RTD and linear resistance input:

RTD type	Min. value	Max. value	Min. span	Standard
Pt100	-200°C	$+850^{\circ}\text{C}$	25°C	IEC 60751
Ni100	-60°C	$+250^{\circ}\text{C}$	25°C	DIN 43760
Lin. R	0Ω	5000Ω	30Ω	-----

Max. offset	50% of selec. max. value
Cable resistance per wire (max.)	5 Ω
Sensor current	Nom. 0.2 mA
Effect of sensor cable resistance (3- / 4-wire)	$< 0.002 \Omega / \Omega$
Sensor error detection	Yes

TC input:

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°C	+2300°C	100°C	ASTM E988-90
LR	-200°C	+800°C	50°C	GOST 3044-84

Max. offset 50% of selec. max. value

Cold junction compensation < ±1.0°C

Sensor error detection..... Yes

Sensor error current:

 When detecting..... Nom. 33 µA

 Else..... 0 µA

Voltage input:

Measurement range..... -12...800 mV

Min. span 5 mV

Max. offset 50% of selec. max. value

Input resistance..... 10 MΩ

Output:**Current output:**

Signal range 4...20 mA

Min. signal range..... 16 mA

Updating time 440 ms

Output signal at EEprom error..... ≤ 3.5 mA

Load resistance..... ≤ (V_{supply} - 7.2) / 0.023 [Ω]

Load stability..... < ±0.01% of span / 100 Ω

Sensor error detection:

Programmable 3.5...23 mA

Namur NE43 Upscale..... 23 mA

Namur NE43 Downscale..... 3.5 mA

Of span = Of the presently selected range

Approvals:

EMC	2004/108/EC
CCOE.....	P337392/1
EAC	TR-CU 020/2011

Marine approval:

Det Norske Veritas, Ships & Offshore Stand. f. Certific. No. 2.4

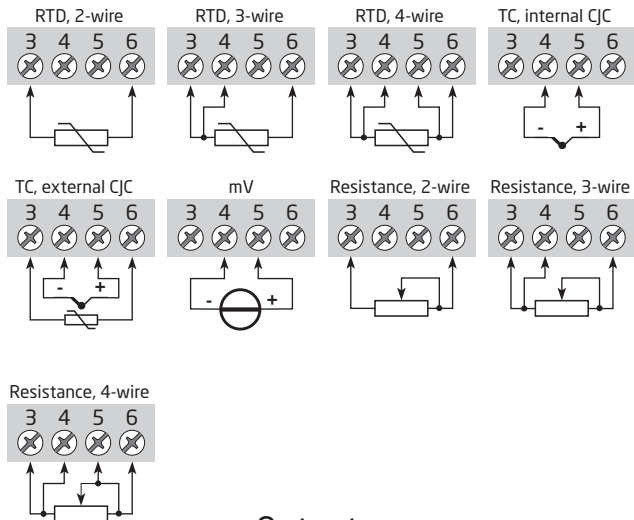
Ex / I.S.:

ATEX 94/9/EC

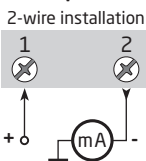
5331A.....	KEMA 10ATEX0002 X
5331D.....	KEMA 06ATEX0062 X
FM certificate	2D5A7
CSA certificate	1125003
IECEX	DEK 13.0035X
INMETRO	DEKRA 13.0001 X
CCOE.....	P337392/2
EAC Ex TR-CU 012/2011	RU C-DK.GB08.V.00410

CONNECTIONS

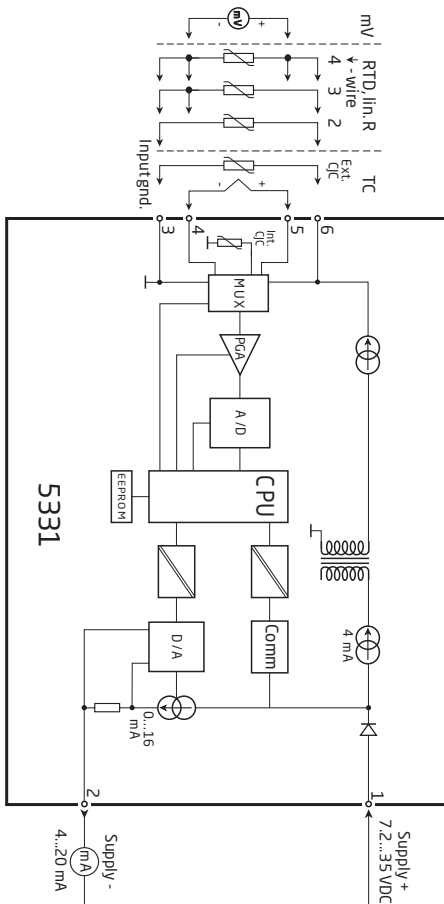
Input:



Output:



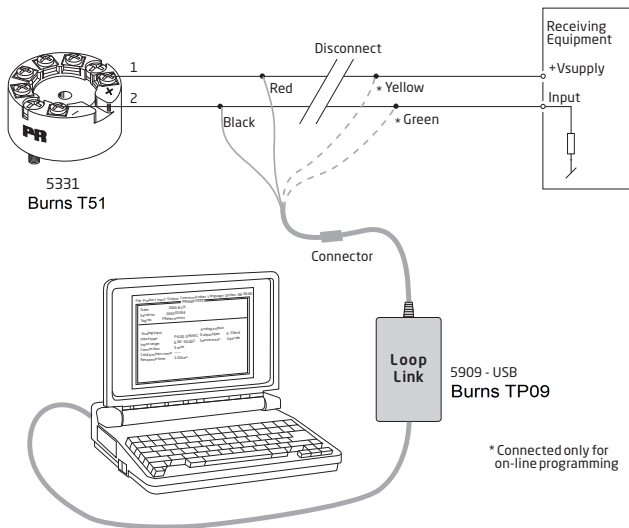
BLOCK DIAGRAM



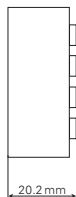
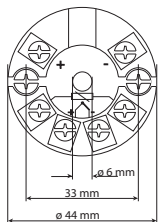
PROGRAMMING

- Loop Link is a communications interface that is needed for programming 5331.
- For programming please refer to the drawing below and the help functions in PReset.
- Loop link is not approved for communication with modules installed in hazardous (Ex) areas.

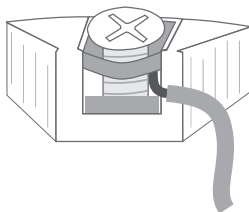
Order: Loop Link



Mechanical specifications



Mounting of sensor wires



Wires must be mounted between the metal plates.

APPENDIX

ATEX Installation Drawing - 5331D

IECEx installation drawing - 5331D

FM Installation Drawing - 5331D

CSA Installation Drawing - 5331D

INMETRO Instruções de Segurança - 5331D

ATEX Installation drawing



For safe installation of 5331D or 5334B 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 06ATEX 0062 X

Marking

 II 1 G Ex ia IIC T4...T6 Ga
II 1 D Ex ia IIIC Da
I M1 Ex ia I Ma

Standards EN 60079-0 : 2012, EN 60079-11 : 2012, EN 60079-26 : 2007,
EN 60079-15 :2010

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

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

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

Terminal: 3,4,5,6

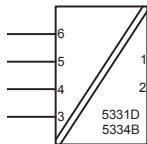
Uo: 9.6 VDC

Io: 25 mA

Po: 60 mW

Lo: 33 mH

Co: 2.4 μ F



Terminal: 1,2

Ui: 30 VDC

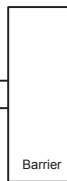
Ii: 120 mA

Pi: 0.84 W

Li: 10 μ H

Ci: 1.0 nF

Non Hazardous Area



Barrier

Installation notes.

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

In a potentially explosive gas atmosphere, the transmitter shall be mounted in an enclosure in order to provide a degree of protection of at least IP20 according to EN60529.

If the transmitter is installed in an explosive atmosphere requiring the use of equipment of category 1 G, 1 M or 2 M, and if the enclosure is made of aluminum, it must be installed such that ignition sources due to impact and friction sparks are excluded.

If the enclosure is made of non-metallic materials, electrostatic charging shall be avoided.

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

The transmitter shall be mounted in a metal enclosure form B according to DIN43729 that is providing a degree of protection of at least IP6X according to EN60529, 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.

For an ambient temperature $\geq 60^{\circ}\text{C}$, heat resistant cables shall be used with a rating of at least 20 K above the ambient temperature.

The surface temperature of the enclosure is equal to the ambient temperature plus 20 K, for a dust layer with a thickness up to 5 mm

IECEx Installation drawing



For safe installation of 5331D or 5334B 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.

Certificate	IECEx DEK 13.0035X
Marking	Ex ia IIC T4...T6 Ga Ex ia IIIC Da Ex ia I Ma
Standards	IEC 60079-0 : 2011, IEC 60079-11 : 2011, IEC 60079-26:2006

Hazardous area

Zone 0, 1, 2, 20, 21, 22, M1

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

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

T6: $-40 \leq T_a \leq 45^\circ\text{C}$

Terminal: 3,4,5,6

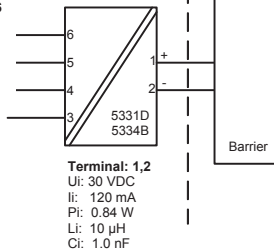
U_o: 9.6 VDC

I_o: 25 mA

P_o: 60 mW

L_o: 33 mH

C_o: 2.4 μF



Installation notes.

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

In a potentially explosive gas atmosphere, the transmitter shall be mounted in a metal form B enclosure in order to provide a degree of protection of at least IP20 according to IEC60529. If however the environment requires a higher degree of protection, this shall be taken into account.

If the transmitter is installed in an explosive atmosphere requiring the use of equipment protection level Ga, Ma and Mb, and if the enclosure is made of aluminum, it must be installed such, that ignition sources due to impact and friction sparks are excluded.

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

For explosive dust atmospheres, the surface temperature of the outer enclosure is 20 K above the ambient temperature.

The transmitter shall be mounted in a metal enclosure form B according to DIN43729 that is providing a degree of protection of at least IP6X according to IEC60529, 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.

For an ambient temperature $\geq 60^{\circ}\text{C}$, heat resistant cables shall be used with a rating of at least 20 K above the ambient temperature.

FM Installation Drawing 5300Q502 Rev AH

Model 5331C, 5331D, 5333C, 5333D and 5343B

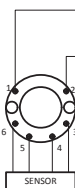
Hazardous (Classified) Location

Class I, Division 1, Groups, A, B, C, D T4..T6
Class I, Zone 0, AEx ia IIC T4..T6

Ambient temperature limits
T4: -40 to + 85 deg. Celsius
T6: -40 to + 60 deg. Celsius

Terminal 1, 2
Vmax or Ui: 30 V
Imax or Ii: 120 mA
Pmax or Pi: 0.84 W
Ci: 1 nF
Li: 10 uH

Terminal 3,4,5,6
Vt or Uo: 9.6 V
It or Io: 28 mA
Pt or Po: 67.2 mW
Ca or Co: 3.5 uF
La or Lo: 35 mH



Non Hazardous Location

Associated Apparatus
or Barrier
with
entity Parameters:

$UM \leq 250V$
 $Voc \text{ or } Uo \leq Vmax \text{ or } Ui$
 $Isc \text{ or } Io \leq Imax \text{ or } Ii$
 $Po \leq Pi$
 $Ca \text{ or } Co \geq Ci + Ccable$
 $La \text{ or } Lo \geq Li + Lcable$

This device must not be connected
to any associated apparatus which
uses or generates more than 250
Vrms

Model 5335C, 5335D, 5336D, 5337D

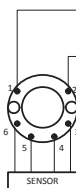
Hazardous (Classified) Location

Class I, Division 1, Groups, A, B, C, D T4..T6
Class I, Zone 0, AEx ia IIC T4..T6

Ambient temperature limits
T4: -40 to + 85 deg. Celsius
T6: -40 to + 60 deg. Celsius

Terminal 1, 2
Vmax or Ui: 30 V
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Pmax or Pi: 0.84 W
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entity Parameters:

$UM \leq 250V$
 $Voc \text{ or } Uo \leq Vmax \text{ or } Ui$
 $Isc \text{ or } Io \leq Imax \text{ or } Ii$
 $Po \leq Pi$
 $Ca \text{ or } Co \geq Ci + Ccable$
 $La \text{ or } Lo \geq Li + Lcable$

This device must not be connected
to any associated apparatus which
uses or generates more than 250
Vrms

The entity concept

The Transmitter must be installed according to National Electrical Code (ANSI-NFPA 70) and shall be installed with the enclosure, mounting, and spacing segregation requirement of the ultimate application.

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_i) 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_i , and C_a and L_a for barriers are provided by the barrier manufacturer.

NI Field Circuit Parameters

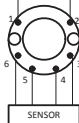
Model 5331C, 5331D, 5333C, 5333D, 5335C, 5335D, 5336D, 5337D and 5343B

Hazardous (Classified) Location

Class I, Division 2, Groups, A, B, C, D T4..T6
Class I, Zone 2, IIC T4..T6

Ambient temperature limits
T4: -40 to +85 deg. Celsius
T6: -40 to +60 deg. Celsius

Terminal 1, 2
 V_{max} : 35 V
C: 1.0 nF
L: 10 uH

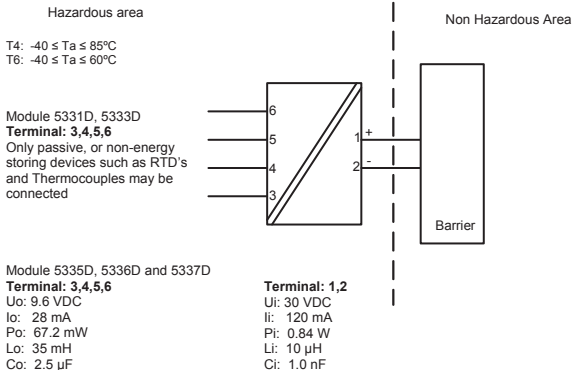


Non Hazardous Location

Associated Apparatus
or Barrier

This device must not be connected
to any associated apparatus which
uses or generates more than 250
VRMS

CSA Installation drawing 533XQC03



CLASS 2258 04 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations
Class I, Division 1, Groups A, B, C and D
Ex ia IIC, Ga

CLASS 2258 84 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations - Certified to US Standards
Class I, Division 1, Groups A, B, C and D
Class I, Zone 0, AEx ia IIC, Ga

Warning:

Substitution of components may impair intrinsic safety.

The transmitters must be installed in a suitable enclosure to meet installation codes stipulated in the Canadian Electrical Code (CEC) or for US the National Electrical Code (NEC).

Desenho de Instalação INMETRO



Para instalação segura do 5331D ou 5334B o seguinte deve ser observado. O modo deve apenas ser instalado por pessoas qualificadas que são familiarizadas com as leis nacionais e internacionais, diretrizes e padrões que se aplicam a esta área.
Ano de fabricação pode ser pego dos dois primeiros dígitos do número de série.

CertificadoDEKRA 13.0001 X

Indicação Ex ia IIC T6...T4 Ga
Ex ia IIIC Da

Padrões ABNT NBR IEC 60079-0 : 2008 ABNT NBR IEC 60079-11 : 2009 IEC 60079-15 : 2010
ABNT NBR IEC 60079-26 : 2008

Áreas Perigosas

Zona 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: $-40 \leq T_a \leq 45^\circ\text{C}$

Terminal: 3,4,5,6

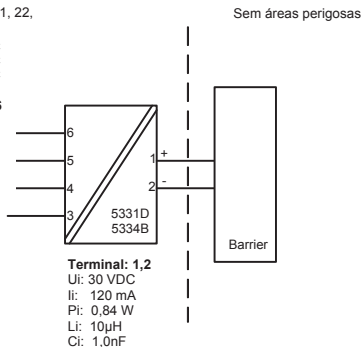
Uo: 9,6 VDC

Io: 25 mA

Po: 60 mW

Lo: 33 mH

Co: 2,4 μF



Notas de instalação

O circuito do sensor não é isolado galvanicamente infalível do circuito de entrada. Contudo, a isolação galvânica entre os circuitos é capaz de resistir a um teste de tensão de 500Vac durante 1 minuto.

Em uma atmosfera de gás potencialmente explosiva, o transmissor deve ser montado em um enclosure a fim de garantir um grau de proteção de no mínimo IP20 de acordo com EN60529. Se contudo o ambiente requer um nível de proteção maior, isso deve ser levado em conta

Se o transmissor é instalado em uma atmosfera explosiva exigindo o uso de equipamento de categoria Ga e se o enclosure é feito de alumínio, ele deve ser instalado de modo que, mesmo em caso de avaria rara, fontes de ignição devido a impacto e fricção, faíscas são eliminadas; se o enclosure é feito de materiais não metálicos, cargas eletroestáticas devem ser evitadas.

Para instalação em atmosfera de poeira potencialmente explosiva, as instruções a seguir:

O transmissor deve ser montado em enclosure de metal forma B de acordo com DIN43729 que está fornecendo um grau de proteção de pelo menos IP6X de acordo com EN60529. Isso é adequado para aplicação e corretamente instalado.

As entradas dos cabos e os elementos de obturação que podem ser utilizados são adequados para a aplicação e corretamente instalados.

Para temperatura ambiente $\geq 60^{\circ}\text{C}$, fios de resistência ao calor devem ser usados com uma faixa de pelo menos 20K acima da temperatura ambiente.

A temperatura da superfície do enclosure é igual à temperatura ambiente mais de 20 K, por uma camada de pó, com uma espessura até 5 mm.

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QUALITY SYSTEM AND ENVIRONMENTAL MANAGEMENT SYSTEM
DS/EN ISO 9001
DS/EN ISO 14001

