



2-WIRE PROGRAMMABLE TRANSMITTER TT521



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2-WIRE PROGRAMMABLE TRANSMITTER TT521

- RTD, TC, Ohm or mV input
- 2 analogue inputs and 5 device variables with status available
- HART protocol (HART 5 or HART 7, selectable)
- Hardware assessed for use in SIL applications
- Mounting on a DIN rail in safe area or hazardous gas and dust area

Application

- Linearized temperature measurement with TC and RTD sensors e.g Pt100 and Ni100.
- HART communication and 4...20mA analog PV output
- Conversion of linear resistance variation to 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 signals.
- Up to 63 transmitters (HART 7) can be connected in multidrop communication setup.

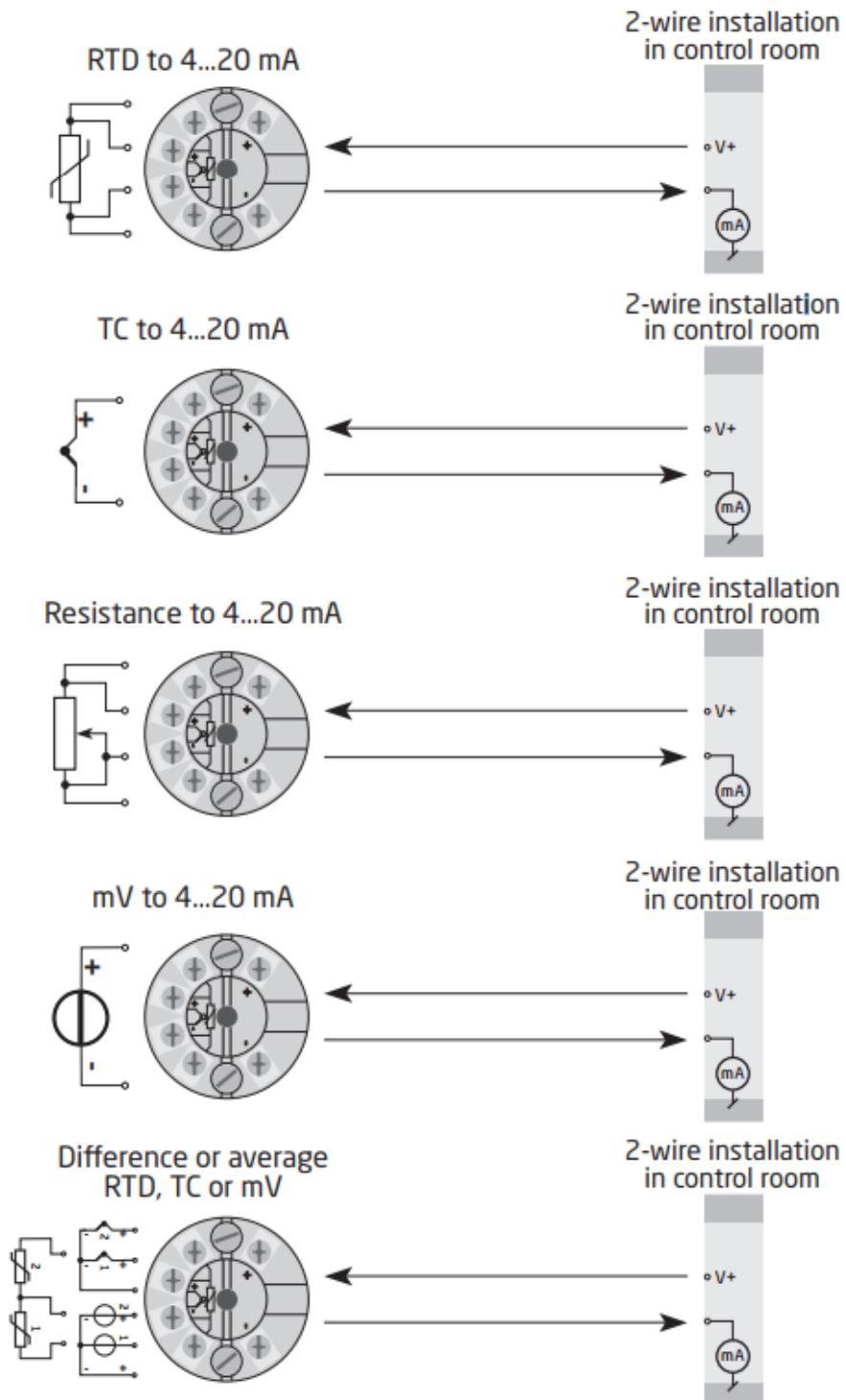
Technical characteristics

- HART® protocol revision can be changed by user configuration to either HART® 5 or HART® 7 protocol.
- The HART® 7 protocol offers:
 - Long Tag numbers of up to 32 characters.
 - Enhanced Burst Mode and Event notification with time stamping.
 - Device variable and status mapping to any dynamic variable PV, SV, TV or QV.
 - Process signal trend measurement with logs and summary data.
 - Automatic event notification with time stamps.
 - Command aggregation for higher communication efficiency.
- TT521 is designed according to strict safety requirements and is therefore suitable for applications in SIL installations.
- Continuous check of vital stored data.
- Meeting the NAMUR NE21 recommendations, the TT521 HART® transmitter ensures top measurement performance in harsh EMC environments. Additionally, the TT521 meets NAMUR NE43 and NE89 recommendations

Mounting/installation

- For DIN form B sensor head mounting. In non-hazardous areas, the TT521 can be mounted on a DIN rail with the AC807 Minco DIN rail adapter.
- Configuration via standard HART® communication interfaces or by AC208517 Loop Link.

APPLICATIONS



To Order TT521:

TT521	Model Number: TT521	
PD	PA = 100 Ω Platinum RTD (.00392) PB = 100 Ω Platinum RTD (.00391) PD = 100 Ω Platinum RTD (.00385) PE = 100 Ω Platinum RTD (.00385) PF = 1000 Ω Platinum RTD (.00385) PW = 1000 Ω Platinum RTD (.00375) CA = 10 Ω Copper RTD (.00427) FA = 604 Ω Nickel-iron FB = 1000 Ω Nickel-iron FC = 2000 Ω Nickel-iron	NA = 120 Ω Nickel E = Type E Thermocouple J = Type J Thermocouple K = Type K Thermocouple T = Type T Thermocouple B = Type B Thermocouple N = Type N Thermocouple R = Type R Thermocouple S = Type S Thermocouple V = Voltage Input
(0/100)	Temperature Range: 4 mA temperature/20 mA temperature or voltage	
C	Range Scale: C = Celsius F = Fahrenheit	
1	Calibration: 1 = Nominal Calibration Nominal calibration option 1 may be ordered for a stand-alone transmitter or for a sensor/transmitter assembly. Matched calibration options 2, 3, and 4 may only be ordered as part of an assembly. 2 = Matched to sensor 0.75% of span (RTD Assembly only) 3 = Matched to sensor 0.50% of span (RTD Assembly only) 4 = Matched to sensor 0.20% of span (RTD Assembly only)	
Y	Sensor Leads: Y = 2 lead RTD, T/C, or V Z = 3 lead RTD X = 4 lead RTD	
TT521PD(0/100)C1Y ← Sample Part Number		

Technical data

Environmental conditions:

Specifications range -40°C to +85°C

Calibration temperature 20...28°C

Relative humidity <95% RH (non-cond.)

Protection degree (encl./terminal) IP68/IP00

Mechanical specifications:

Dimensions Ø 44 x 20.2 mm

Weigh approx. 50 g

Max. wire size 1 x 1.5 mm² stranded wire

Screw terminal torque 0.4 Nm

Vibration IEC 60068-2-6 Test : 2007

2...25 Hz..... ±1.6 mm

25...100 Hz..... ±4 g

Common electrical specifications:

Supply voltage, DC:

ATEX, CSA, FM, IECEx & INMETRO	8.0...30 V
Voltage drop	8.0 V
Isolation – test / working	1.5 kVAC / 50 VAC
Signal /noise ratio	> 60 dB
Communications interface	AC208517 via HART7
Response time (programmable)	1...60 s

Accuracy

Calibration	Type	Accuracy
Nominal	Pt(.00385) RTD	±0.05% of span [$\pm 0.1^\circ\text{C}$]
	Ni RTD	±0.05% of span [$\pm 0.2^\circ\text{C}$]
	Thermocouple Types E, J, K, T, N	±0.05% of span [$\pm 0.5^\circ\text{C}$]
	Thermocouple Types B, R, S	±0.05% of span [$\pm 1^\circ\text{C}$]
	Linear R	±0.05% of span [$\pm 0.1 \Omega$]
	Volt	±0.05% of span [$\pm 10 \mu\text{V}$]
Matched	RTD	See ordering options

TC cold junction compensation..... $< \pm 1.0^\circ\text{C}$

Max. offset on input signal..... 50% of selec. max. value

EMC immunity influence $< \pm 0.1\%$ of span

Extended EMC immunity:

NAMUR NE 21, A criterion, burst $< \pm 1\%$ of span

Input specifications:**RTD input types:**

Pt50, Pt100, Pt200, Pt500, Pt1000, Ni50, Ni100, Ni120, Ni1000

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

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	----

TC input types:

Type	Min temperature	Max temperature	Min span	Standard
B	0°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	-200°C	+900°C	50°C	DIN 43710
Lr	-200°C	+800°C	50°C	GOST 3044-84
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

Cold junction compensation (CJC):

Constant, internal or external via a Pt100 or Ni100 sensor

mV input:

Voltage input range..... -800...+800 mV

Min. span..... 2.5 mV

Input resistance..... 10 MΩ

Output:

Signal range 4...20 mA
Min. signal range 16 mA
Updating time 440 ms
Load resistance $\leq (\text{Vsupply} - 8) / 0.023 [\Omega]$
Sensor error detection, programmable 3.5...23mA
NAMUR NE43 Upscale 23 mA
NAMUR NE43 Downscale 3.5 mA
HART protocol revisions..... HART 5 and HART 7

Approvals:

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

Marine approval:

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

Ex / I.S.:

ATEX 94/9/EC..... KEMA 03ATEX1537
IECEx..... KEM 10.0083 X
FM certificate..... 2D5A7
CSA certificate..... 1125003
INMETRO certificate..... NCC 12.0844 X
EAC Ex TR-CU 012/2011..... RU C-DK.GB08.V.00410

Functional Safety:

Hardware assessed for use in SIL applications
FMEDA report – contact Minco Products, Inc.

Changing the HART protocol version

It is possible to change the unit's HART protocol revision by using the Temptran Utilities software and AC205817, or a HART interface. Other HART configuration tools like a handheld HART Terminal may also be used.

Procedure for using a HART hand-held terminal to change the TT521 from HART 7 to HART 5 (and vice versa)

Change the TT521 from HART 7 to HART 5:

Drive the TT521 device **Online** and enter **Device setup – Diag/Service**.

Select "**Write protection**" and **Write protect** by entering "*****" (8 stars).

Select **New password** – type "*****" (8 stars) and then "**HARTREV5**"

Select **Write enable** by entering "-CHANGE-

Change the TT521 from HART 5 to HART 7:

Drive the TT521 device **Online** and enter **Device setup – Diag/Service**.

Select "**Write protection**" and **Write protect** by entering "*****" (8 stars).

Select **New password** – type "*****" (8 stars) and then "**HARTREV7**"

Select **Write enable** by entering "-CHANGE-

Changing the HART protocol version using the Temptran Utilities software and AC205817

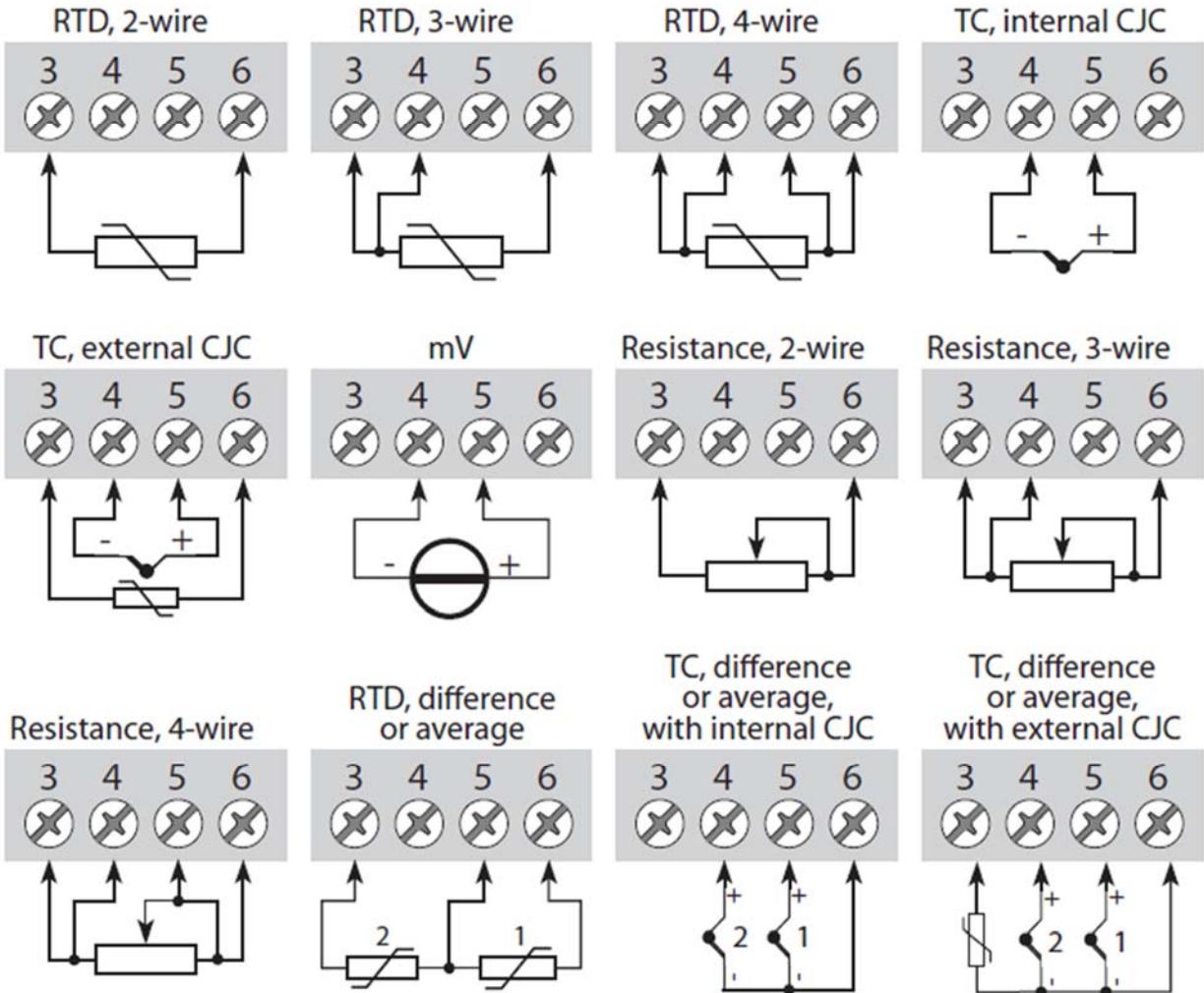
NOTE: YOU CANNOT CHANGE BACK TO HART 7 USING TEMPTRAN UTILITIES! A HART TERMINAL MUST BE USED (see above)

Switching from HART 7 to HART 5

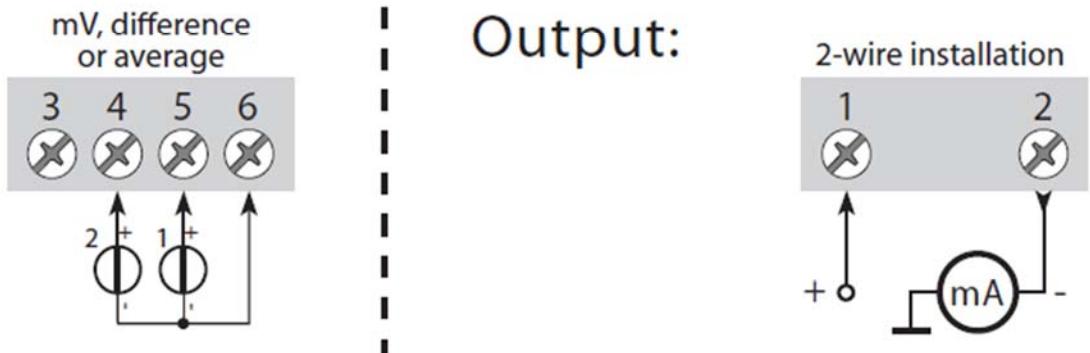
Select the TT521 product, click the "**HART**" tab and open the folder "**Methods**". Click "**Device Password / Write Protection / Protocol...**" and select "**Change protocol to HART 5**" in the pop-up window, then acknowledge by pressing OK.

CONNECTIONS

Input:



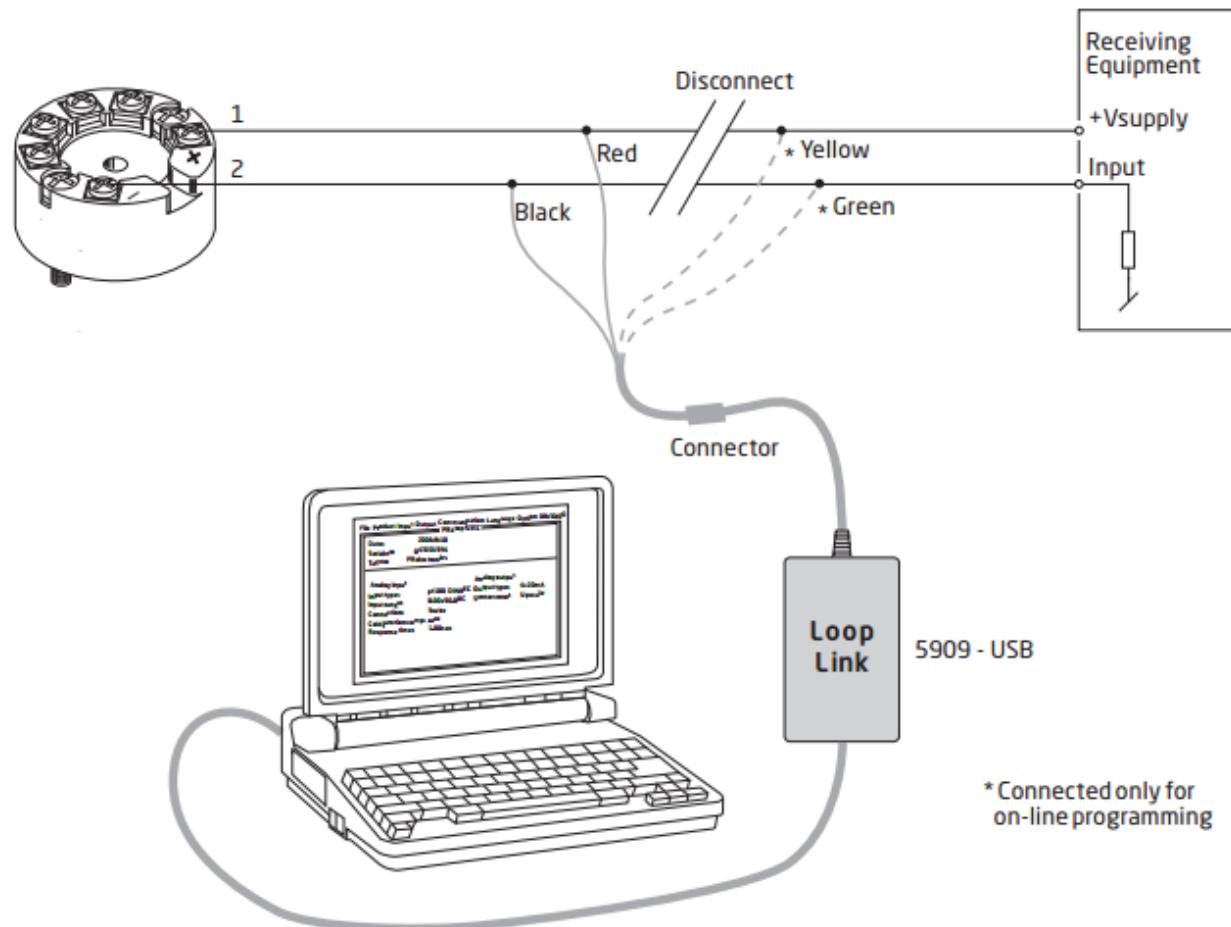
Output:



Programming

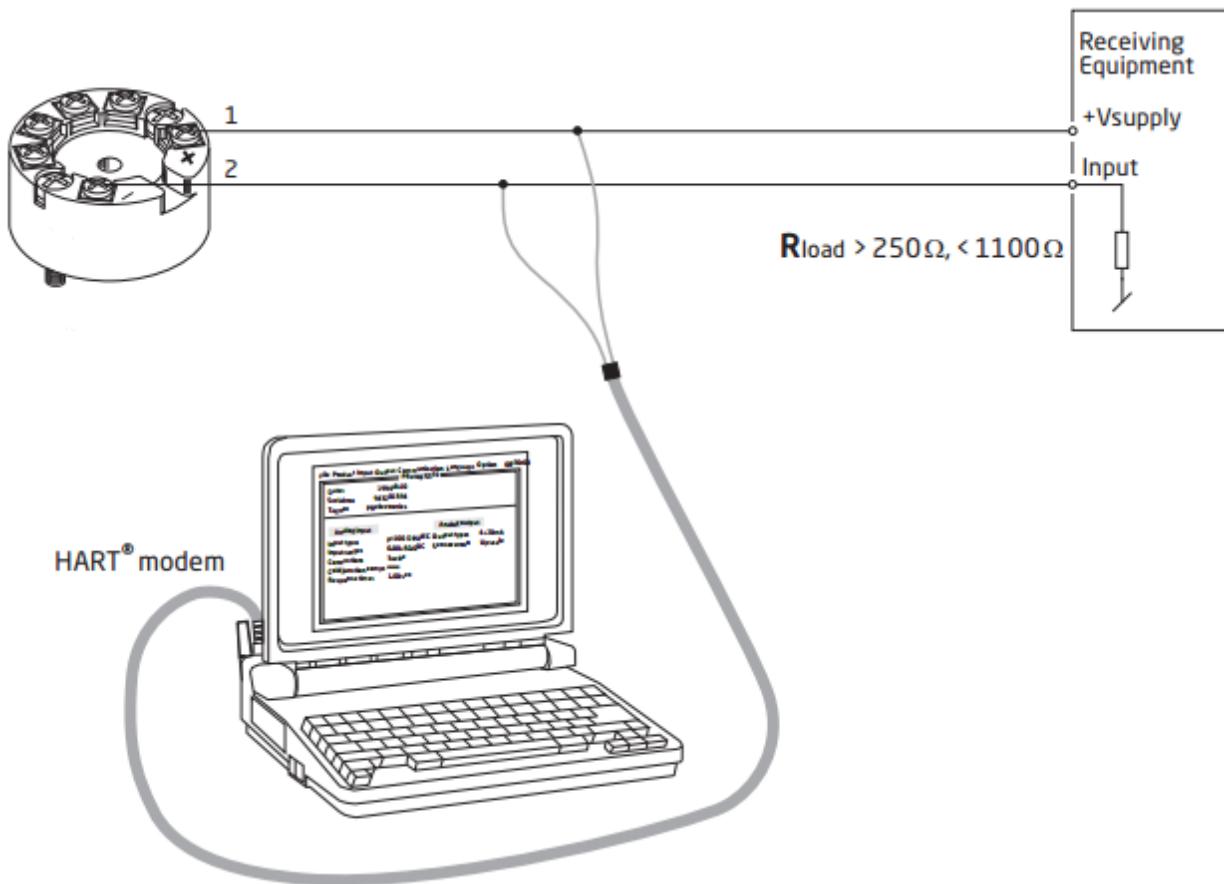
Temptran Utilities and AC205817 Programmer

- Use Temptran Utilities software to program the TT518, TT519, TT520 & TT521
- Use AC205817
- For programming please refer to the drawing below.
- Not approved for communication with modules installed in hazardous (Ex) areas.



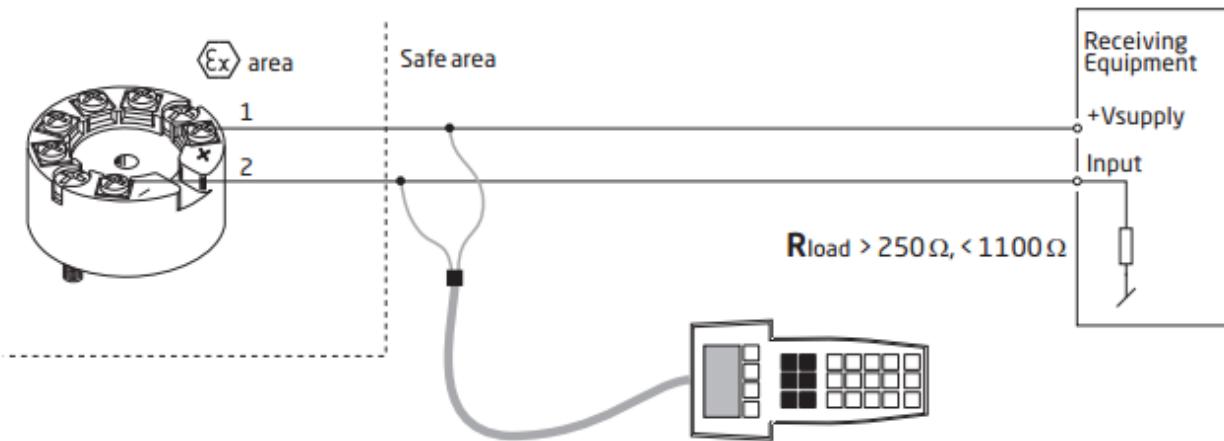
HART Modem

For programming, please refer to the drawing below and the help functions in Temptran Utilities.



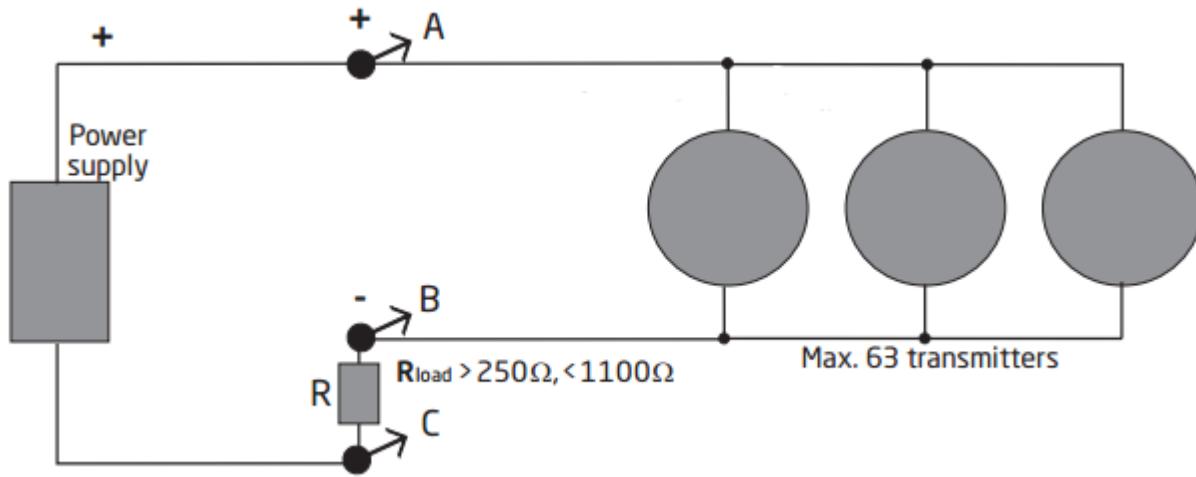
HART Communicator

For programming please refer to the drawing below. To gain access to product-specific commands, a suitable HART communicator must be loaded with the PR electronics A/S DDL driver. This can be ordered either at the HART Communication Foundation or at PR electronics A/S.



Collection of Transmitters in Multidrop Mode

The HART communicator of a PC Modem can be connected across AB or BC.



The outputs of maximum 63 transmitters can be connected in parallel for a digital HART 7 communication on 2-wires.

Before it is connected, each transmitter must be configured with a unique number from 1 to 63. If 2 transmitters are configured with the same number, both will be excluded.

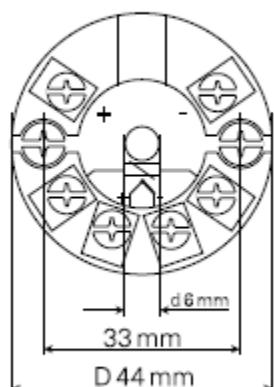
The transmitters must be programmed for multidrop mode (with a fixed output signal of 4 mA).

Maximum current in the loop is therefore 252 mA.

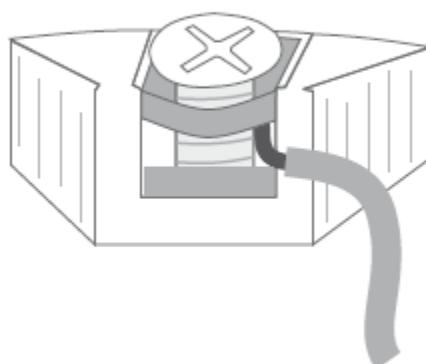
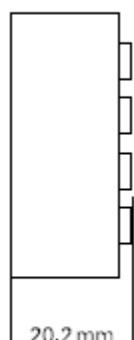
The communication is either by means of HART communicator or a HART modem.

The Temptran Utilities configuration software can configure the individual transmitter for multidrop mode and provide it with a unique polling address.

Mechanical specifications



Mounting of sensor wires



Wires must be mounted between the metal plates.

Appendix

ATEX Installation Drawing 5335QA01



For safe installation of TT521 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 on the serial number.

ATEX Certificate

KEMA 03ATEX 1537

Marking



II 1 G Ex ia IIC T6...T4 Ga

II 1 D Ex ia IIIC Da

II M1 Ex ia I Ma

Standards

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

Hazardous area

Zone 0, 1, 2, 20, 21, 22, and Coal mining

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

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

Terminal: 3,4,5,6

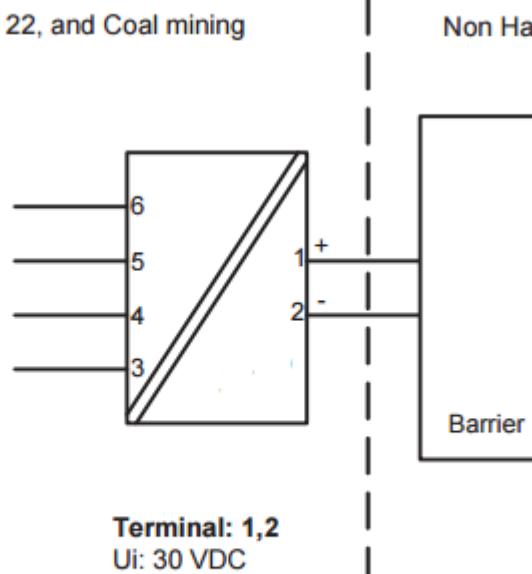
Uo: 9.6 VDC

Io: 28 mA

Po: 67 mW

Lo: 35 mH

Co: 3.5 μF



Terminal: 1,2

Ui: 30 VDC

Ii: 120 mA

Pi: 0.84 W

Li: 10 μH

Ci: 1.0 nF

Installation notes:

General installation instructions

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.

If the enclosure is made of aluminum, it must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded. If the enclosure is made of non-metallic materials or painted metals electrostatic charging shall be avoided.

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

The transmitter shall be mounted in an enclosure form B according to DIN43729 or equivalent that is providing a degree of protection of at least IP20 according to EN60529 that is suitable for the application and correctly installed.

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 or equivalent, 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 installation in mines the following instructions apply:

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

If the enclosure is made of aluminum, it must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded.

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

The enclosure shall not contain by mass more than

- a) 15 % in total of aluminum, magnesium, titanium and zirconium, and
- b) 7,5 % in total of magnesium, titanium and zirconium.

IECEx Installation drawing



For safe installation of the TT521 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 10.0083X

Marking

Ex ia IIC T6..T4 Ga

Ex ia IIIC Da

Ex ia I Ma

Standards IEC 60079-11 : 2011, IEC 60079-0 : 2011, IEC 60079-26 : 2006

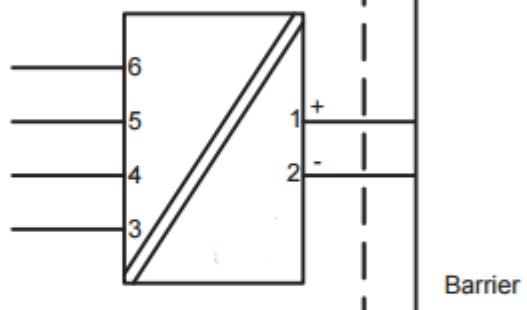
Hazardous area

Zone 0, 1, 2, 20, 21, 22 and Coal mining

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

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

Terminal: 3,4,5,6
Uo: 9.6 VDC
Io: 28 mA
Po: 67 mW
Lo: 35 mH
Co: 3.5 μF



Non Hazardous Area

Terminal: 1,2
Ui: 30 VDC
Ii: 120 mA
Pi: 0.84 W
Li: 10 μH
Ci: 1.0 nF

Installation notes

General installation instructions

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.

If the enclosure is made of aluminum, it must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded. If the enclosure is made of non-metallic materials or painted metals electrostatic charging shall be avoided

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

The transmitter shall be mounted in an enclosure form B according to DIN43729 or equivalent that is providing a degree of protection of at least IP20 according to IEC 60529 that is suitable for the application and correctly installed.

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 or equivalent, that is providing a degree of protection of at least IP6X according to 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.

For installation in mines the following instructions apply:

The transmitter shall be mounted in a metal enclosure that is providing a degree of protection of at least IP6X according to IEC 60529, and 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.

If the enclosure is made of aluminum, it must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded. If the enclosure is made of non-metallic materials or painted metals electrostatic charging shall be avoided.

The enclosure shall not contain by mass more than

- a) 15 % in total of aluminum, magnesium, titanium and zirconium, and
- b) 7,5 % in total of magnesium, titanium and zirconium.

Installation Drawing 5300Q502

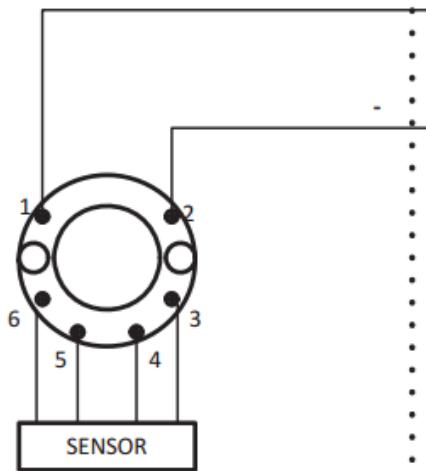
Hazardous (Classified) Location

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

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 $Ui(VMAX)$ and current $li(IMAX)$, and maximum power $Pi(Pmax)$, which the device can receive and remain intrinsically safe, must be equal to or greater than the voltage (Uo or VOC or Vt) and current (Io or ISC or It) and the power Po which can be delivered by the barrier.

The sum of the maximum unprotected capacitance (Ci) for each intrinsically safe device and the interconnecting wiring must be less than the capacitance (Ca) 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_t and I_o, I_{SC} or I_t , and C_a and L_a for barriers are provided by the barrier manufacturer.

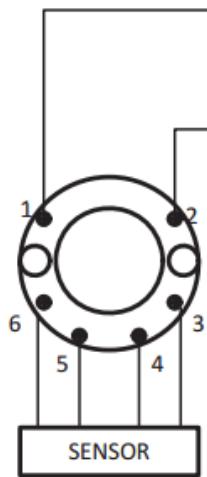
NI Field Circuit Parameters

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. Celcius
T6: -40 to + 60 deg. Celcius

Terminal 1 , 2
 $V_{max} : 35 V$
 $C_i: 1.0 nF$
 $L_i:10 \mu H$

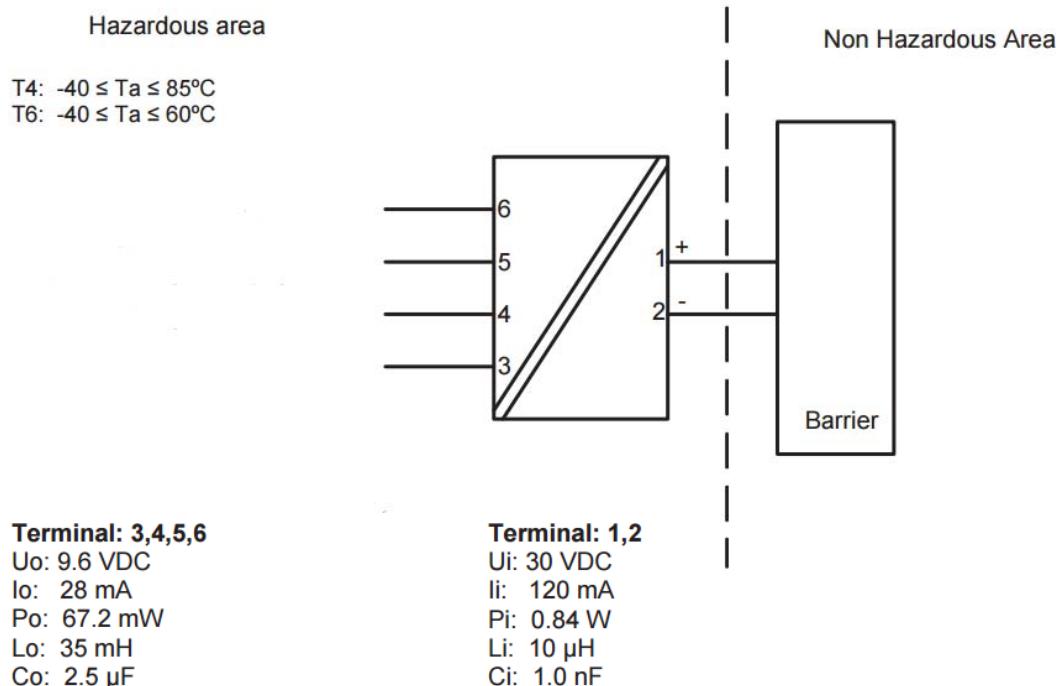


Non Hazardous Location

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).

Instruções de Segurança 5335QB01

TT521: Instalação Ex:

ATENÇÃO - RISCO POTENCIAL DE CARGA ELETROSTÁTICA - VER INSTRUÇÕES

Para a instalação segura do transmissor TT521 em áreas classificadas, deve-se observar o seguinte:

O módulo necessita ser instalado somente por pessoal qualificado e que tenham familiaridade com normas internacionais, diretrizes e normalização aplicadas à estas áreas.

O ano de fabricação do instrumento pode ser obtido, observando-se os primeiros dois dígitos do seu número de série.

O circuito do sensor não está com isolação galvânica total em relação ao circuito de entrada. Todavia a isolação galvânica entre os circuitos é capaz de suportar teste de voltagem de 500 Vac durante 1 minuto.

O transmissor precisa ser montado em um invólucro com um grau de proteção pelo menos IP-20.

Em atmosferas explosivas compostas por misturas de ar / poeira:

O transmissor somente poderá ser instalado em uma atmosfera potencialmente explosiva composta por poeira combustível se estiver montado no interior de um invólucro metálico forma B de acordo com a norma DIN 43729 com um grau de proteção pelo menos IP-6X de acordo com a norma IEC 60529, que seja adequado para esta aplicação e corretamente instalado.

As entradas dos cabos e outras barreiras a serem utilizadas devem ser adequadas e corretamente instaladas.

Onde a temperatura ambiente for $\geq 60^{\circ}\text{C}$, devem ser utilizados cabos resistentes ao calor que resistam pelo menos 20K acima da temperatura ambiente.

Se o invólucro onde o transmissor está montado for feito de alumínio e instalado em Zona 0, 1 ou Zona 20,21 ou 22, este não deve conter mais do que 6% do seu peso total de magnésio e titânio.

Acessórios adicionais ao invólucro devem ser projetados e/ou instalados de tal modo que até mesmo eventos de rara incidência, fontes de ignição causadas por impactos e faíscas por fricção sejam excluídas.

Ex ia IIC T6...T4 Ga

Ex ia I Ma

Certificado:: NCC 12.0844 X

Temp. amb. máxima T1...T4 85°C

Temp. amb. máxima T5 e T6 45°C

Aplicável em Zona 0, 1, 2

Sinal de saída / alimentação , terminal 1 e 2:

Ui : 30 VDC
Ii : 120 mA
Pi : 0,84 W
Li : 10 μ H
Ci : 1,0 nF

Entrada do sensor, terminais 3, 4, 5 e 6:

Uo : 9,6 VDC
Io : 28 mA
Po : 67 mW
Lo : 35 mH
Co : 3,5 μ F