MINCO TT521 2 Wire Programmable Transmitter Instructions

Contents

MINCO

MINCO TT521 2 Wire Programmable Transmitter

Product Information

Specifications

- **Input Types:**
  - **RTD:** Pt50, Pt100, Pt200, Pt500, Pt1000, Ni50, Ni100, Ni120, Ni1000
  - **Thermocouple:** B, E, J, K, L, Lr, N, R, S, T, U, W3, W5
  - Linear Resistance
  - mV
- **Communication Protocol:** HART 5 or HART 7 (selectable)
- **Analog Inputs:** 2
- **Device Variables with Status:** 5
- **Mounting:** DIN rail in safe area or hazardous gas and dust area
- **Environmental Conditions:**
  - **Operating Temperature:** -40°C to +85°C
  - **Calibration Temperature:** 20°C to 28°C
  - **Relative Humidity:** Up to 60%
- **Communications Interface:** AC208517 via HART7
- **Response Time (Programmable):** 1 to 60 seconds

Product Usage Instructions

Mounting/Installation

The TT521 can be mounted on a DIN rail in safe areas or hazardous gas and dust areas. For DIN form B sensor head mounting in non-hazardous areas, the TT521 can be mounted on a DIN rail using the AC807 Minco DIN rail

adapter.

RTD Measurement
The TT521 supports linearized temperature measurement with RTD sensors, such as Pt100 and Ni100. To measure temperature using an RTD sensor, follow these steps:

1. Connect the RTD sensor to the RTD input terminals of the TT521.
2. Ensure the RTD sensor type matches one of the supported types (e.g., Pt100, Ni100).
3. Configure the desired temperature units and calibration settings through the device's HART communication interface.
4. The TT521 will convert the RTD sensor's resistance variation into a standard 4-20mA current signal, which can be used for temperature measurement.

Thermocouple Measurement
The TT521 also supports temperature measurement using thermocouples. To measure temperature using a thermocouple, follow these steps:

1. Connect the thermocouple to the TC input terminals of the TT521.
2. Ensure the thermocouple type matches one of the supported types (e.g., B, E, J, K, T, etc.).
3. Configure the desired temperature units and calibration settings through the device's HART communication interface.
4. The TT521 will convert the thermocouple's voltage output into a standard 4-20mA current signal, which can be used for temperature measurement.

Linear Resistance Measurement
The TT521 can convert linear resistance variation to a standard 4-20mA current signal. This feature is useful for measuring variables such as valve positions or Ohmic level sensors. To measure linear resistance, follow these steps:

1. Connect the linear resistance source to the input terminals of the TT521.
2. Configure the desired calibration settings through the device's HART communication interface.
3. The TT521 will convert the linear resistance variation into a standard 4-20mA current signal, which can be used for measurement.

mV Signal Amplification
The TT521 can amplify a bipolar mV signal to a standard 4-20mA current signal. To amplify an mV signal, follow these steps:

1. Connect the mV signal source to the input terminals of the TT521.
2. Configure the desired calibration settings through the device's HART communication interface.
3. The TT521 will amplify the mV signal and convert it into a standard 4-20mA current signal.

HART Communication
The TT521 supports HART communication, allowing for advanced configuration and monitoring of the device. To utilize HART communication, follow these steps:

1. Connect the TT521 to a HART-enabled communication interface, such as AC208517.

2. Use compatible HART software or equipment to establish communication with the TT521.
3. Through the HART interface, configure various device parameters, such as calibration settings, variable mapping, and event notifications.
4. Monitor and retrieve data from the TT521 using the HART interface.

FAQ

- **How many transmitters can be connected in a multidrop communication setup?**
  Up to 63 transmitters (HART 7) can be connected in a multidrop communication setup.
- **Is the TT521 suitable for use in SIL installations?**
  Yes, the TT521 is designed according to strict safety requirements and is suitable for applications in SIL installations.
- **What are the supported RTD input types?**
  The supported RTD input types are Pt50, Pt100, Pt200, Pt500, Pt1000, Ni50, Ni100, Ni120, and Ni1000.
- **What is the maximum cable resistance per wire for RTD inputs?**
  The maximum cable resistance per wire is 5Ω (up to 50Ω per wire is possible with reduced measurement accuracy).
- **What is the voltage input range for mV inputs?**
  The voltage input range for mV inputs is -800mV to +800mV.
- **What is the input resistance for mV inputs?**
  The input resistance for mV inputs is 10MΩ.

INTRODUCTION

- 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.

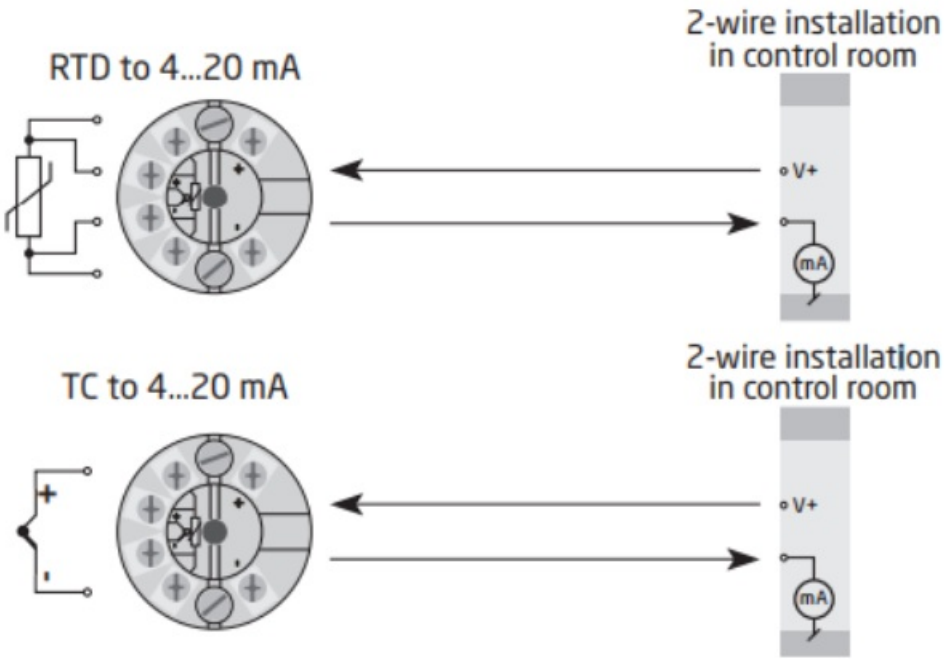
Technical characteristics

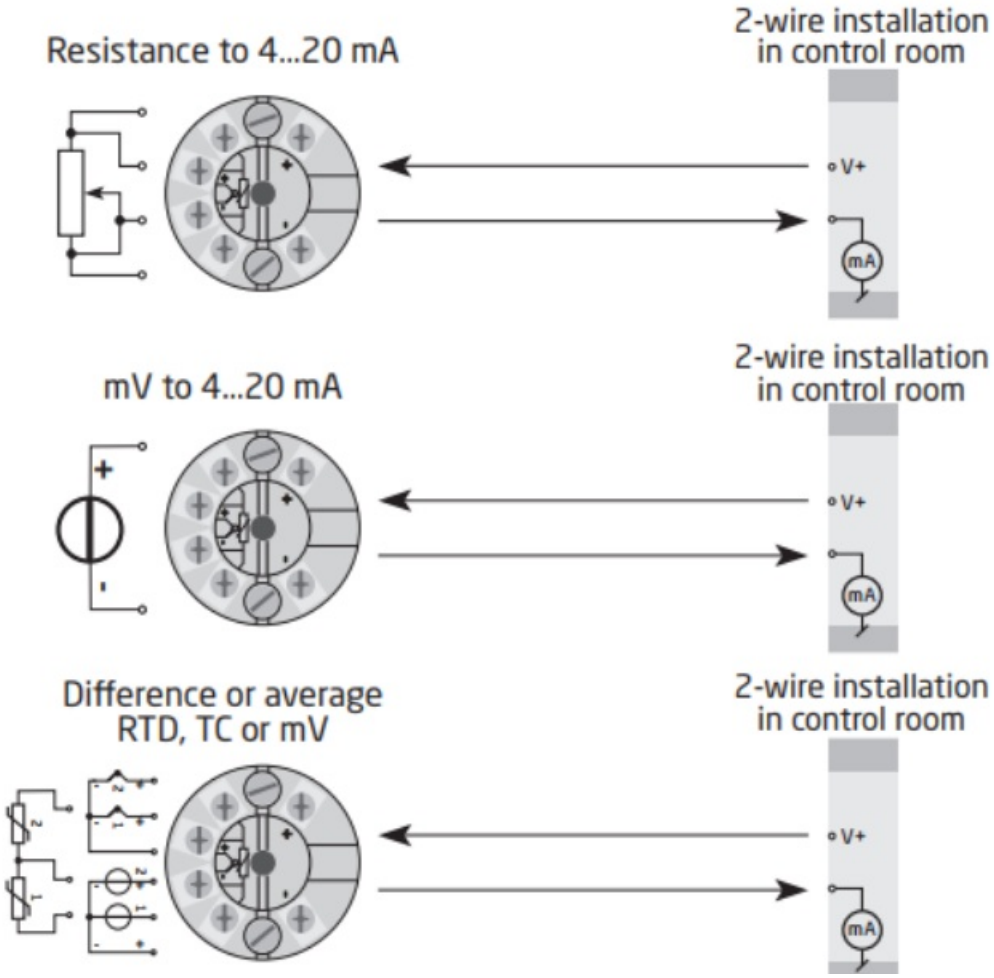
- HART® protocol revision can be changed by user configuration to either HART® 5 or HART® 7 protocol.
- The HART® 7 protocol offers:
  - Long Tag numbers of up to 32 characters.

    - 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.





To Order TT521:

TT521	Model Number: **TT521**
PD	PA = 100 Ω Platinum RTD (.00392) NA = 120 Ω Nickel PB = 100 Ω Platinum RTD (.00391) E = Type E Thermocouple PD = 100 Ω Platinum RTD (.00385) J = Type J Thermocouple PE = 100 Ω Platinum RTD (.00385) K = Type K Thermocouple PF = 1000 Ω Platinum RTD (.00385) T = Type T Thermocouple PW = 1000 Ω Platinum RTD (.00375) B = Type B Thermocouple CA = 10 Ω Copper RTD (.00427) N = Type N Thermocouple FA = 604 Ω Nickel-iron R = Type R Thermocouple FB = 1000 Ω Nickel-iron S = Type S Thermocouple FC = 2000 Ω Nickel-iron V = Voltage Input
(0/100)	Temperature Range: 4 mA temperature/20 mA temperature or voltage
C	Range Scale: C = Celsius mV = Millivolts 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** -40oC to +85oC
  - **Calibration temperature** 20…28oC
  - **Relative humidity** <95% RH (non-cond.)7
  - **Protection degree (encl./terminal)** IP68/IP00
- **Mechanical specifications:**
  - **Dimensions** Ø 44 x 20.2 mm
  - **Weigh approx**. 50 g
  - **Max. wire size** 1 x1.5 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 [±0.1°C]
	Ni RTD	±0.05% of span [±0.2°C]
	Thermocouple Types E, J, K, T, N	±0.05% of span [±0.5°C]
	Thermocouple Types B, R, S	±0.05% of span [±1°C]
	Linear R	±0.05% of span [±0.1 Ω]
	Volt	±0.05% of span [±10 µV]
Matched	RTD	See ordering options

  - **TC cold junction compensation** < ±1.0°C
  - **Max. offset on input signal** 50% of selec. max. value
  - **EMC immunity influence** < ±0.1% of span
  - **Extended EMC immunity:**

    NAMUR NE 21, A criterion, burst < ±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** ≤ (Vsupply - 8) / 0.023 [Ω]
  - **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-"

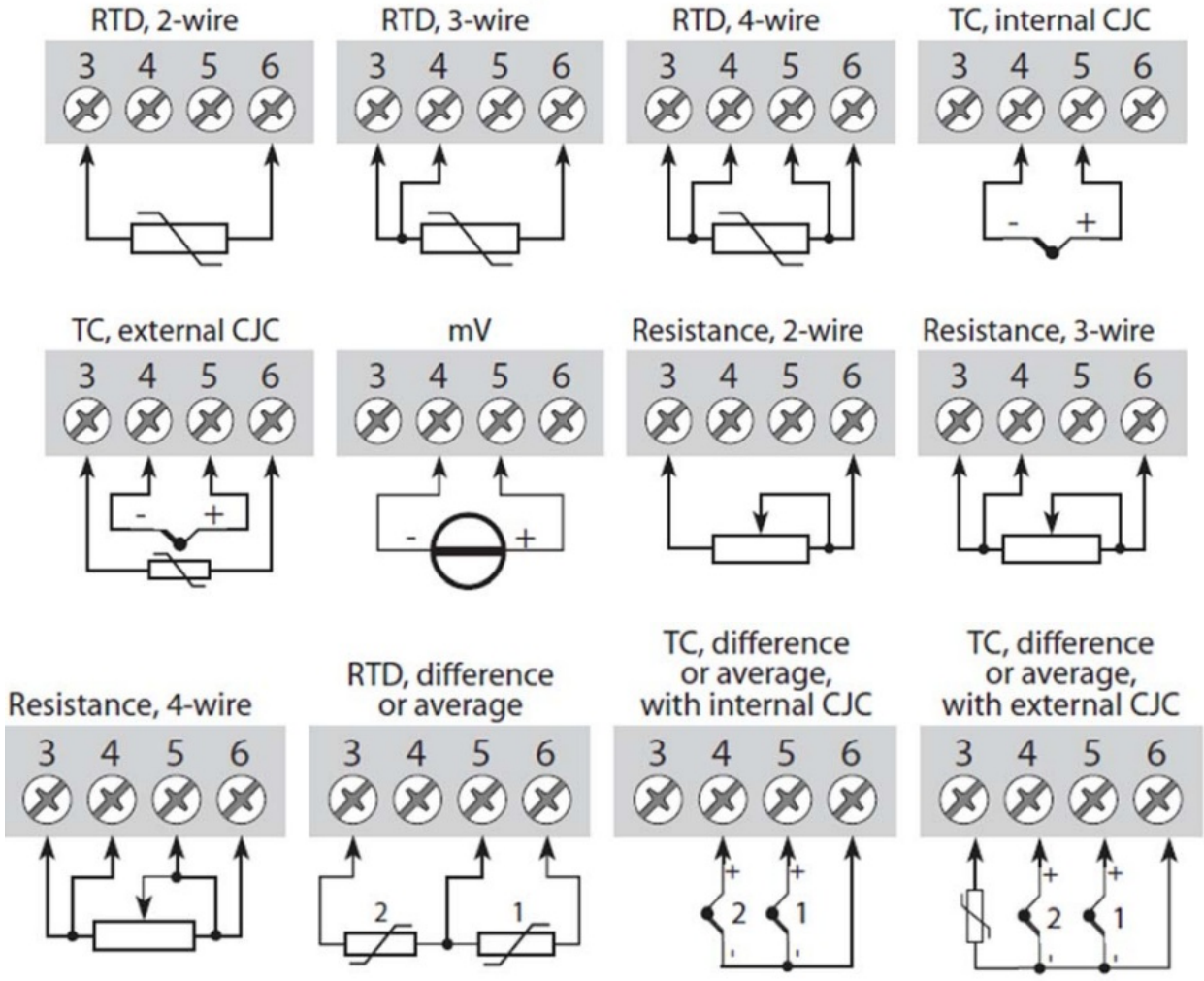
Changing the HART protocol version using the Temptran Utilities software and AC205817

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

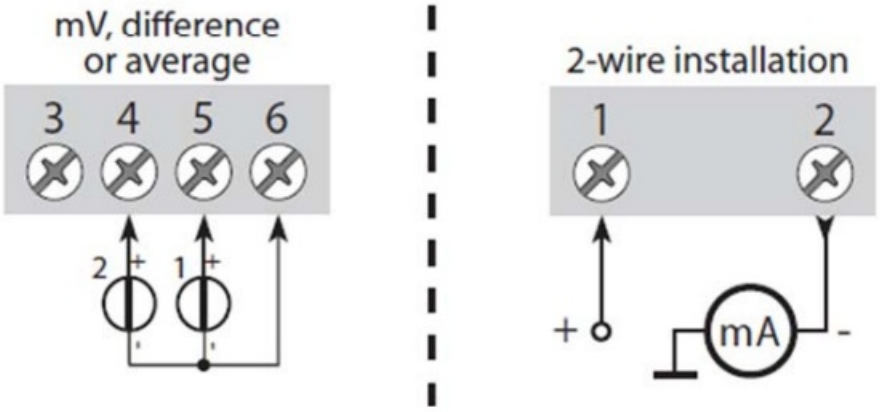
Switching from HART 7 to HART 5
Select the TT521 product, click the "HART" tab and open the folder "Methods". Click "Device Password / Write Protection / Protocol…" and select "Change protocol to HART 5" in the pop-up window, then acknowledge by pressing OK.

CONNECTION

- **INPUT**



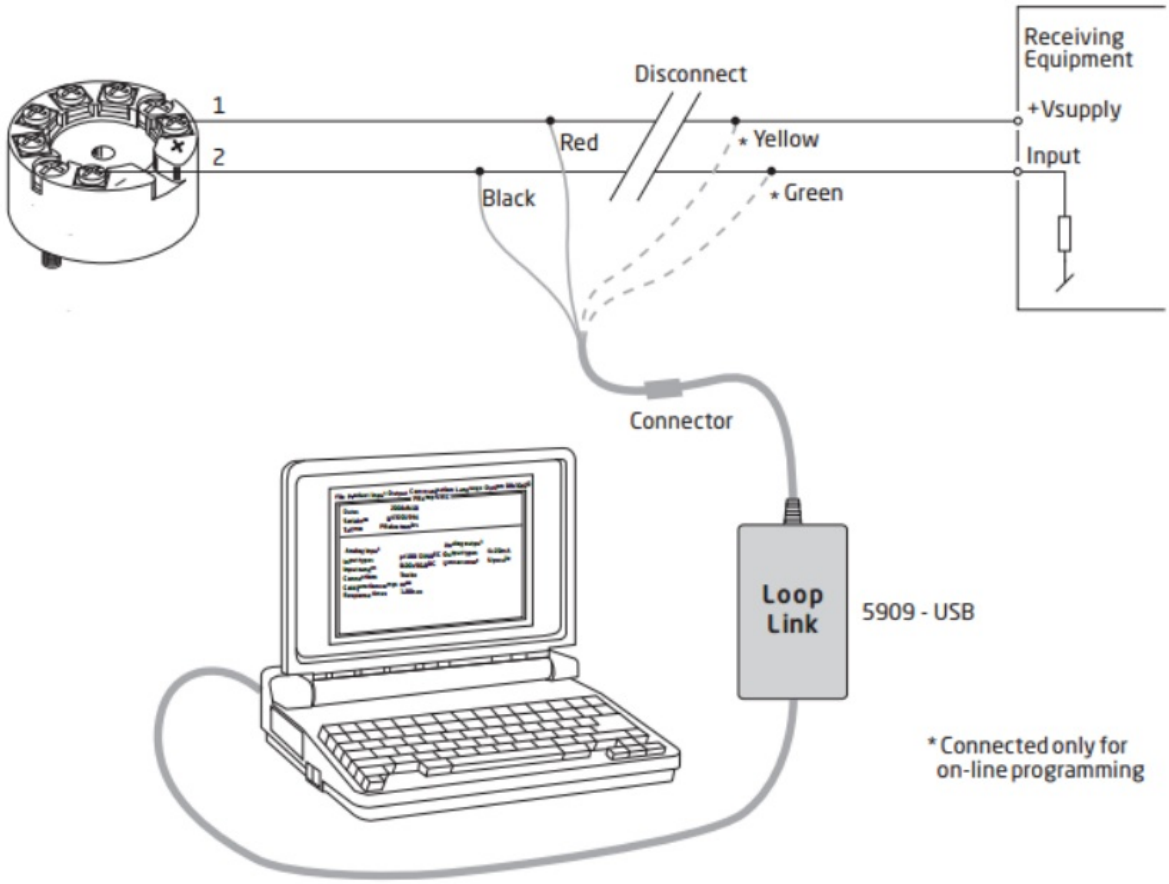
- **OUTPUT**



Programming

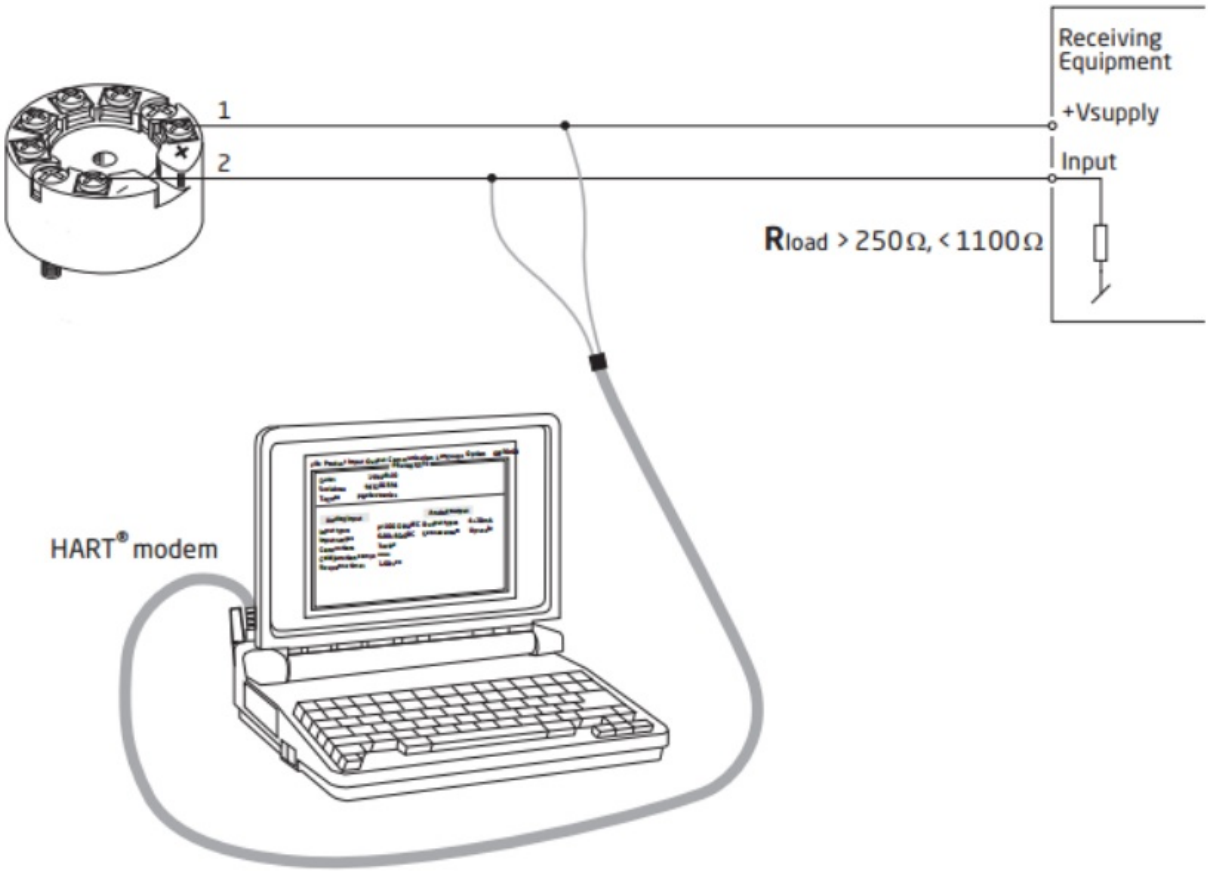
Temptran Utilities and AC205817 Programmer

- 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

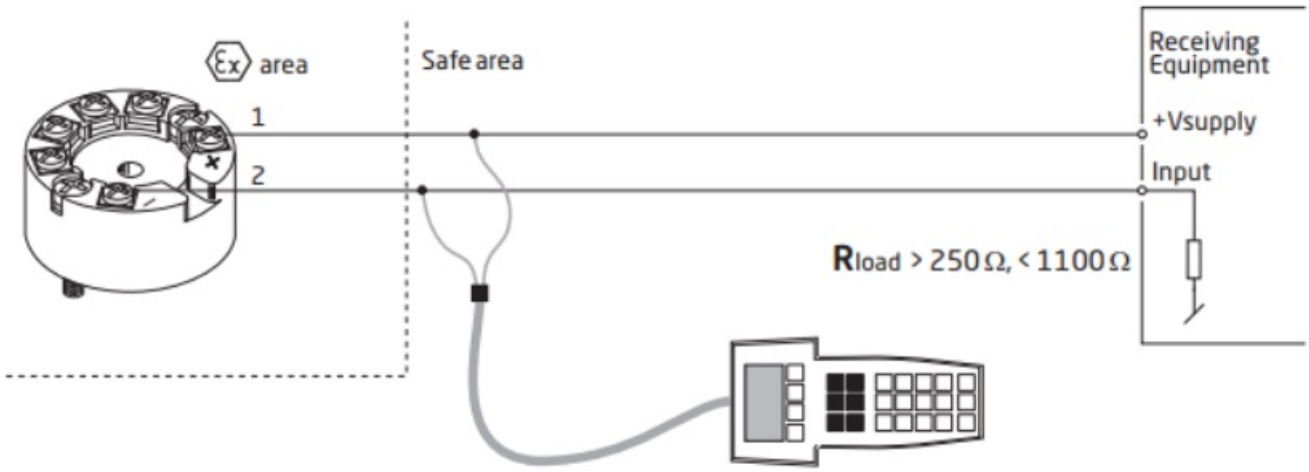
For programming, please refer to the drawing below and the help functions in Temptran Utilities.



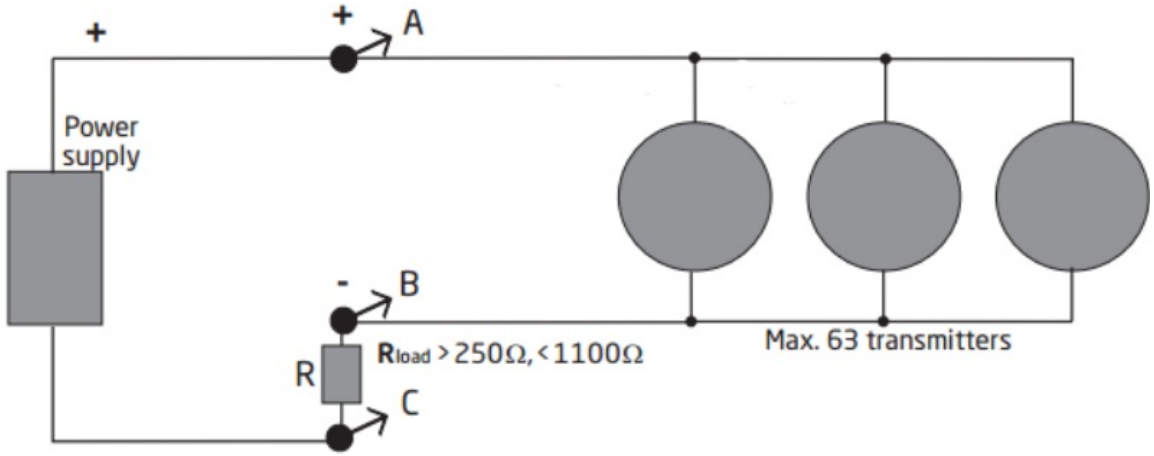
HART Communicator

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.

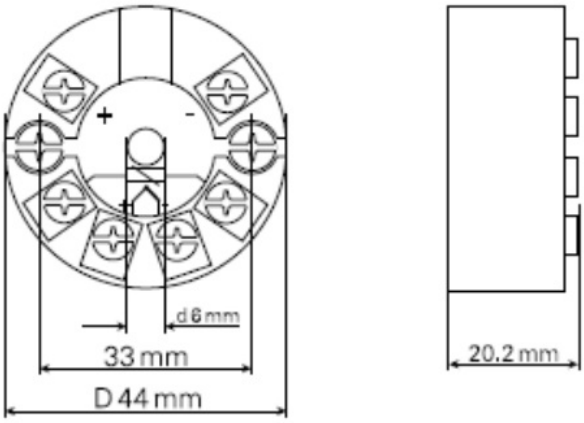


Collection of Transmitters in Multidrop Mode
The HART communicator of a PC Modem can be connected across AB or BC.

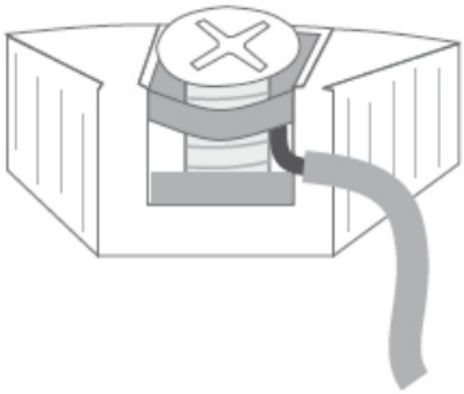


- The outputs of maximum 63 transmitters can be connected in parallel for a digital HART 7 communication on 2-wires.
- Before it is connected, each transmitter must be configured with a unique number from 1 to 63. If 2 transmitters are configured with the same number, both will be excluded.
- The transmitters 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

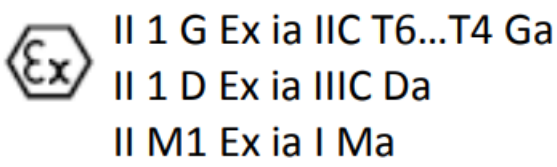


Wires must be mounted between the metal plates.

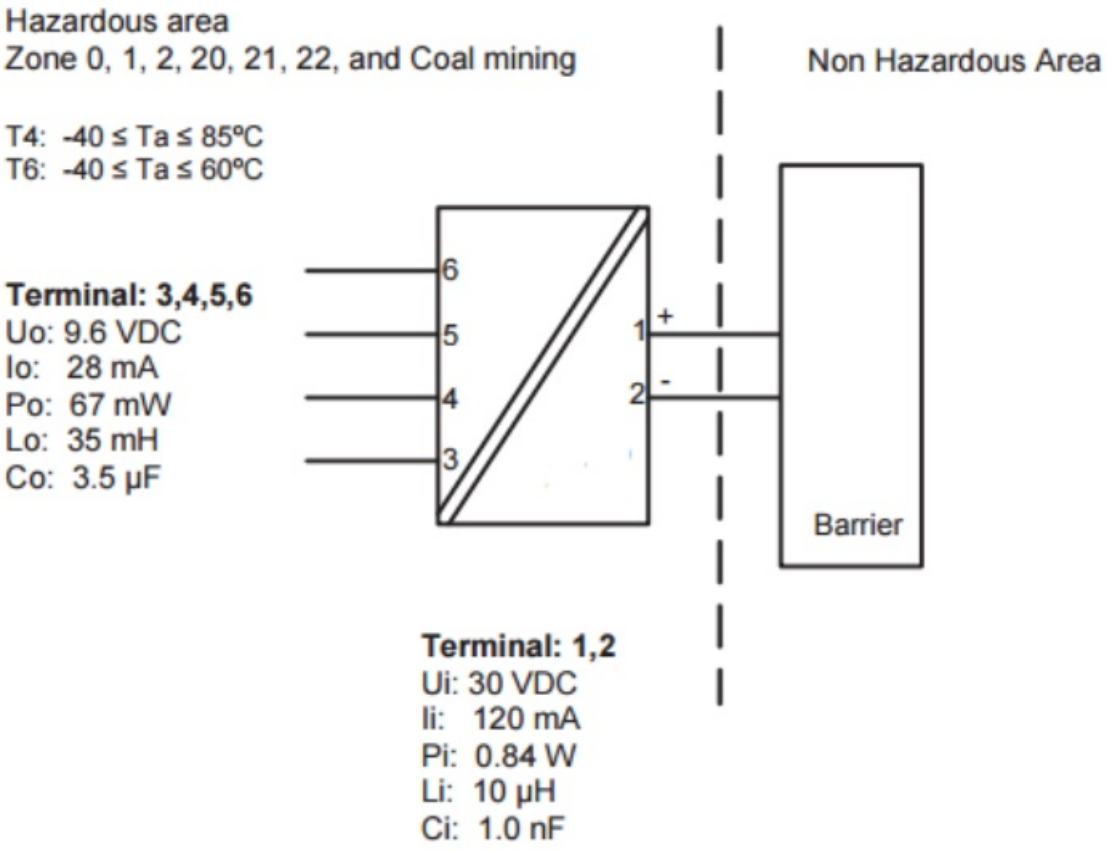
Appendix

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**



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



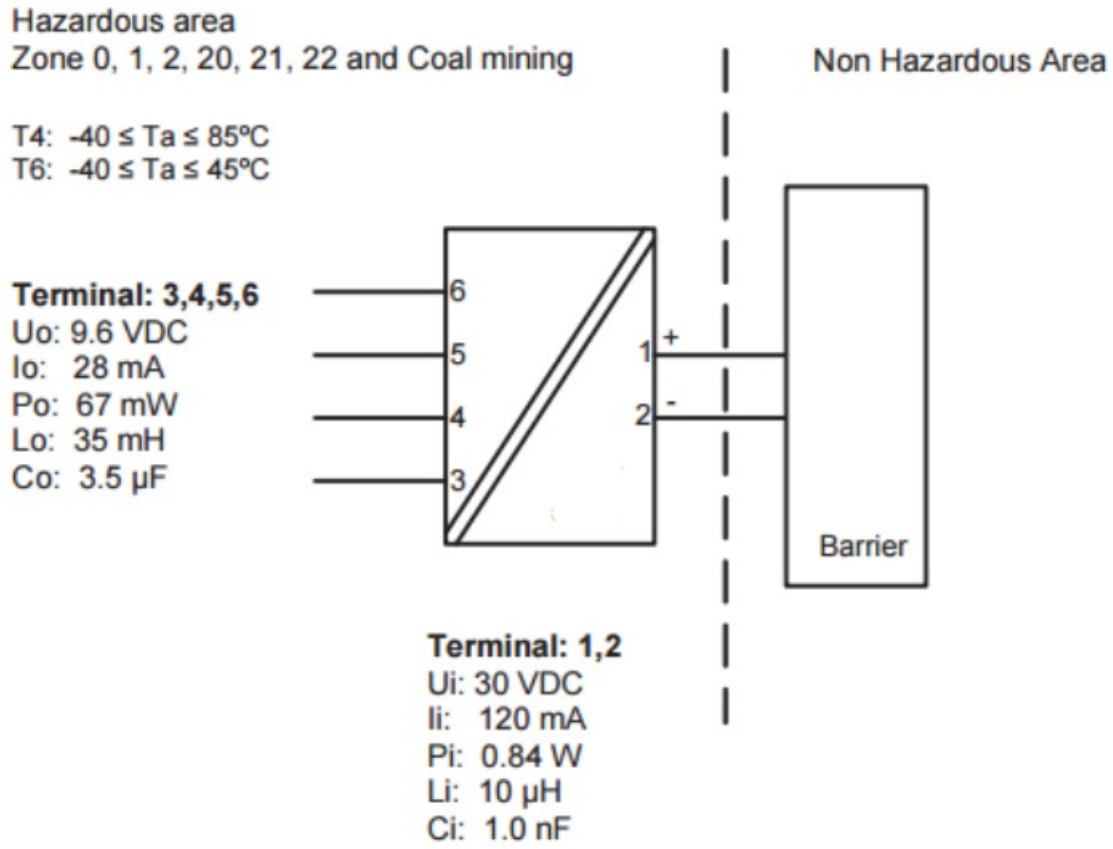
Installation notes:

- **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
  - 15 % in total of aluminum, magnesium, titanium and zirconium, and
  - 7,5 % in total of magnesium, titanium and zirconium.

IECEx Installation drawing

- For save 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



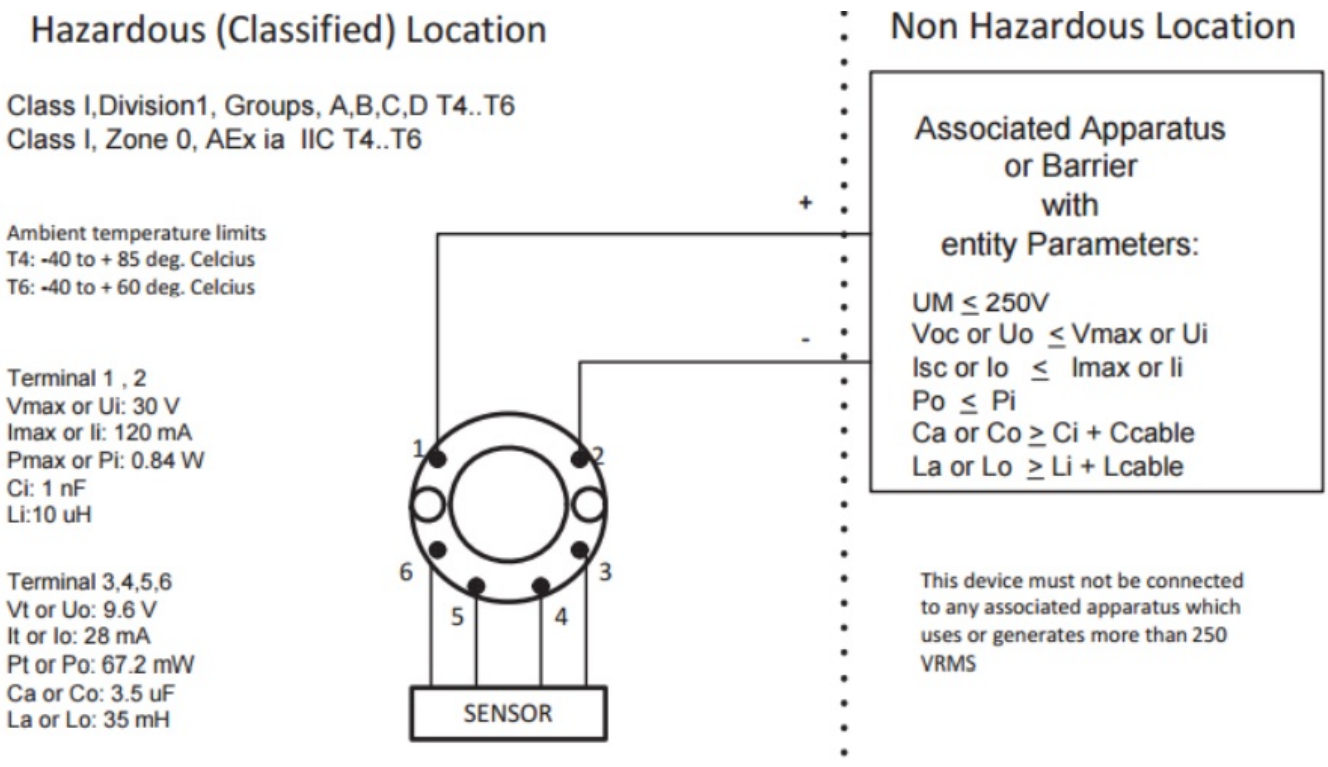
Installation notes

- **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

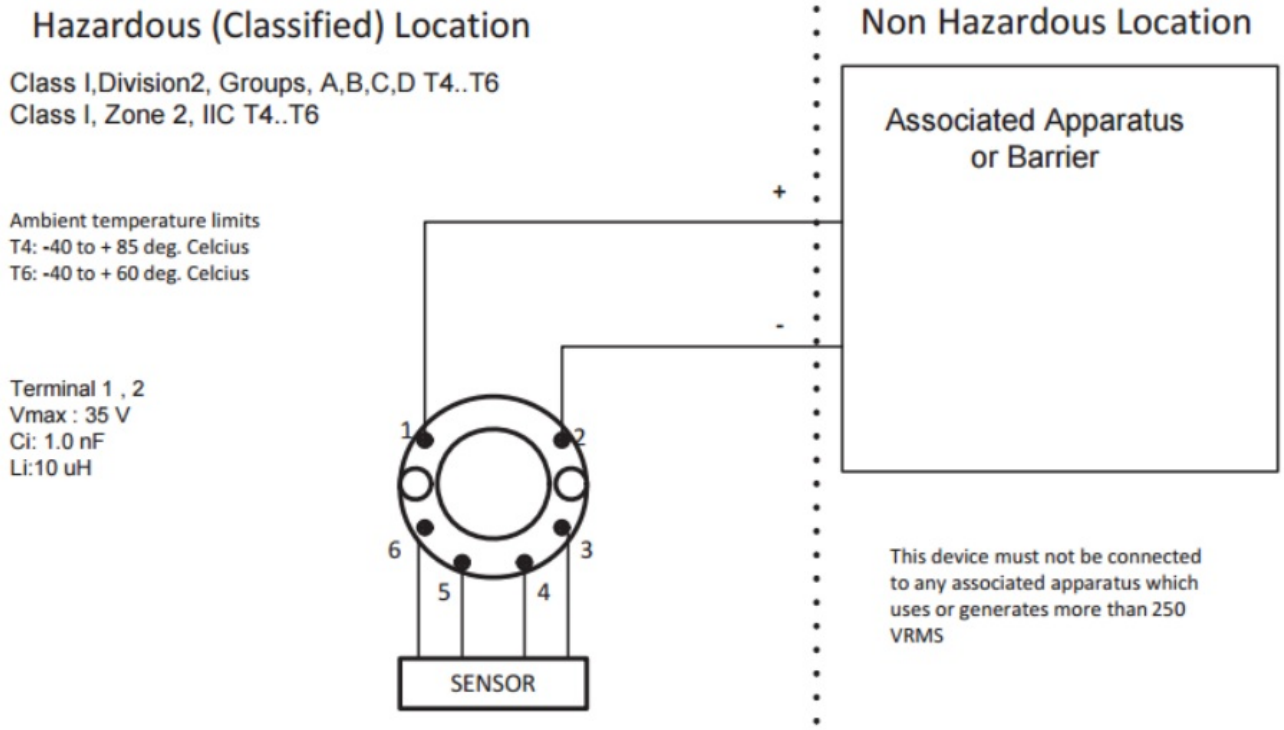
- **For installation in a potentially explosive gas atmosphere, the following instructions apply:**
  The transmitter shall be mounted in an enclosure form B according to DIN43729 or equivalent that is providing a degree of protection of at least IP20 according to IEC 60529 that is suitable for the application 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
    - 15 % in total of aluminum, magnesium, titanium and zirconium, and
    - 7,5 % in total of magnesium, titanium and zirconium.

Installation Drawing 5300Q502

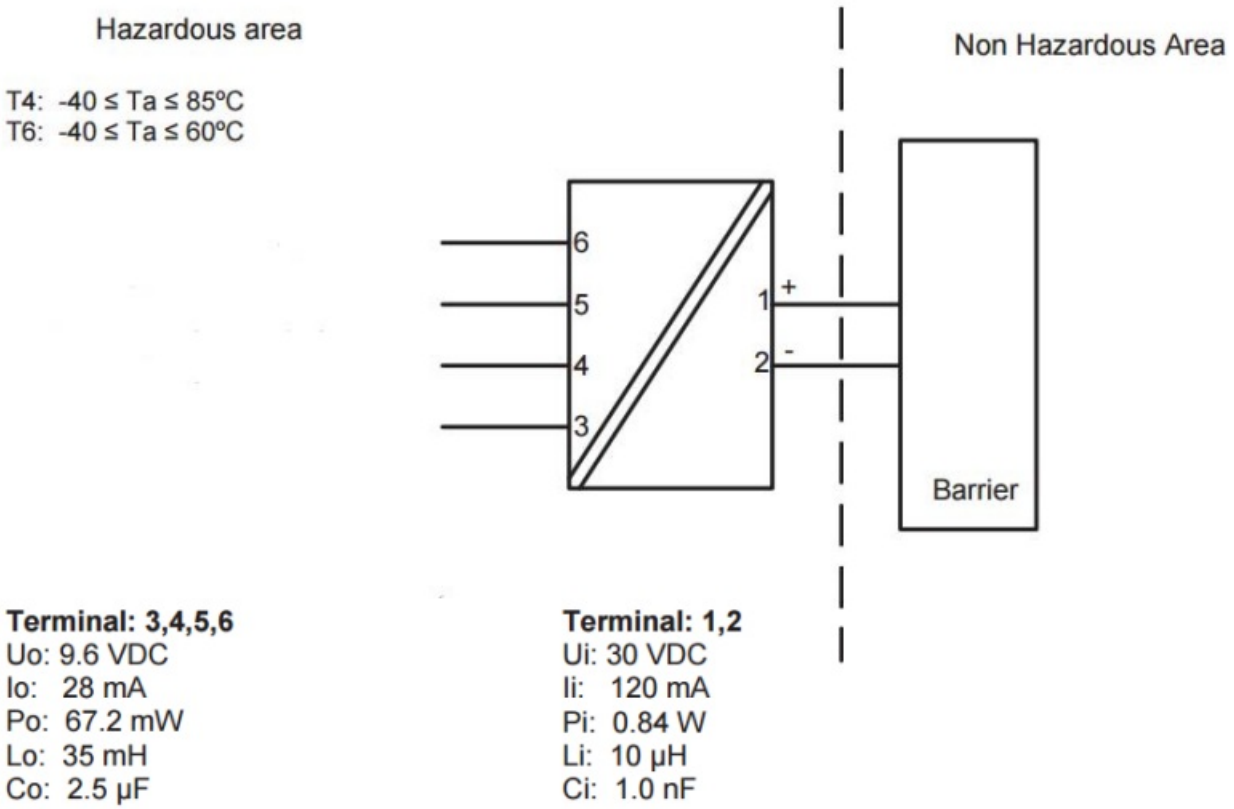


The entity concept

- 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 Ii(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 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 (Li) for each intrinsically device and the interconnecting wiring must be less than the inductance (La) which can be safely connected to the barrier.
- The entity parameters Uo,VOC or Vt and Io,ISC or It, and Ca and La for barriers are provided by the barrier manufacturer.



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).

ABOUT COMPANY

- Minco Products, Inc.
- Tel: 763.571.3121
- www.minco.com

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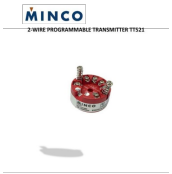
Documents / Resources

	**MINCO TT521 2 Wire Programmable Transmitter** [pdf] Instructions TT521 2 Wire Programmable Transmitter, TT521, 2 Wire Programmable Transmitter, Wire Programmable Transmitter, Programmable Transmitter, Transmitter

References

- Home - Minco
- User Manual