

OPERATION MANUAL

CTS-420

Position Transmitter System



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CTS-420

Position Transmitter System

1. Introduction

The CTS-420 Position Transmitter System consists of a matched package of a differential position transducer (LVDT or RVDT) and an electronic signal conditioner/transmitter which provide a 4-20mA output from a 10-36VDC loop supply.

WARNING: The transmitter module will not work properly with other transducers, and no substitutions should be attempted.

2. Product Specifications

For complete specifications and ordering information, please refer to the datasheet at:

<http://www.te.com/usa-en/product-CAT-LVDT0035.html>

ELECTRICAL							
Parameter	CTS-420 250	CTS-420 500	CTS-420 1000	CTS-420 2000	CTS-420 4000	CTS-420 10000	CTS-420 0-90
Transducer model	HCI 125	HCI 250	HCI 500	HCI 1000	HCI 2000	HCI 5000	R36AS
Measurement range	0.250 [6.35]	0.500 [12.7]	1.0 [25.4]	2.0 [50.8]	4.0 [101.6]	10.0 [254]	0 to 90°
Non-linearity, max.	±0.5% of FR			±1.5% of FR			
Temperature coefficient of sensitivity	±0.02%/°F [±0.036%/°C]						
Loop supply voltage	10 to 36VDC						
Output	4 to 20mA						
Output at null position	12mA (null position is defined as the mid-range position)						
Max loop resistance	595 ohms @ 24VDC (see loop resistance chart below)						
Stability	0.05% of FSO after 30 minutes warm up						
Frequency response	100Hz @ -3db						
Controls	Zero and span potentiometers, 10 turns						

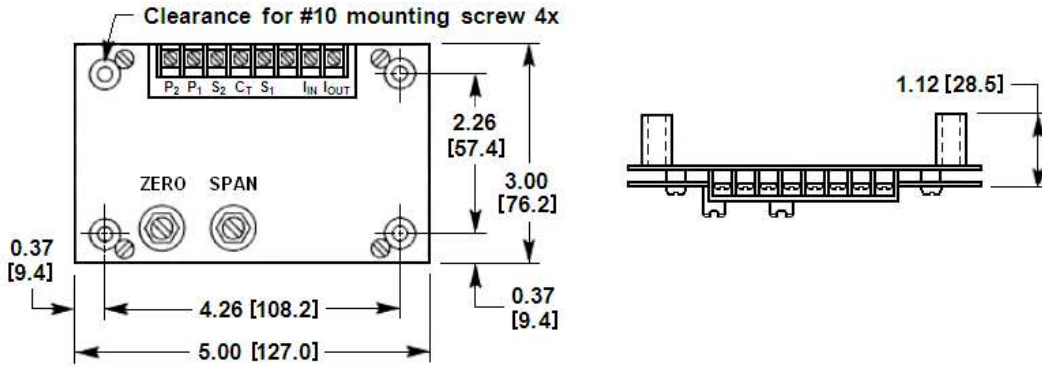
ENVIRONMENTAL & MATERIALS	
Operating temperature range (LVDT/RVDT)	-67°F to +300°F [-55°C to +150°C]
Operating temperature (Electronics module)	-40°F to +200°F [-40°C to +95°C]
Housing material (LVDT/RVDT)	AISI 400 Series stainless steel
Electrical connections (LVDT/RVDT)	6-pin MS type connector (MIL-C-5015)
IEC 60529 rating (LVDT)	IP68 to 1,000 PSI [70 bars] with use of proper mating connector plug

NOTES:

- All values are nominal unless otherwise noted
- Dimensions are in inch [mm] unless otherwise noted
- FR (Full Range): The range, end to end. FR=2xS for ±S range; FR=S for a 0 to S range
- FSO (Full Scale Output): Largest absolute value of the outputs measured at the ends of the range

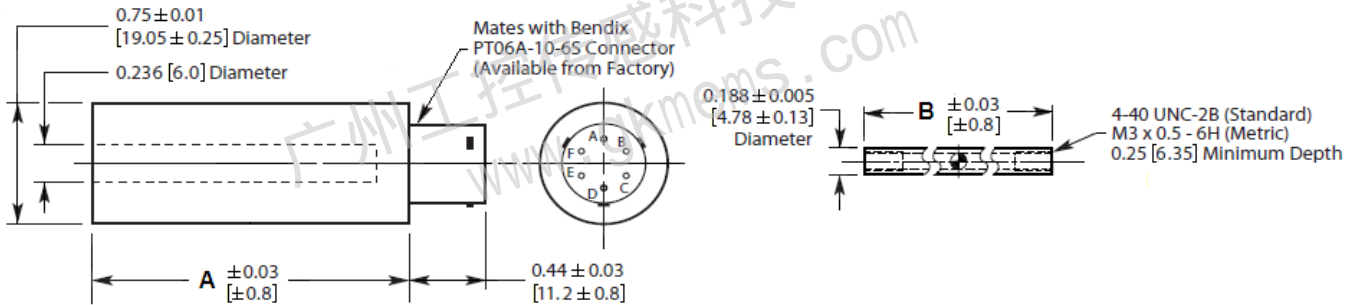
3. Dimensions

3.1 Signal Conditioner/Transmitter Dimensions

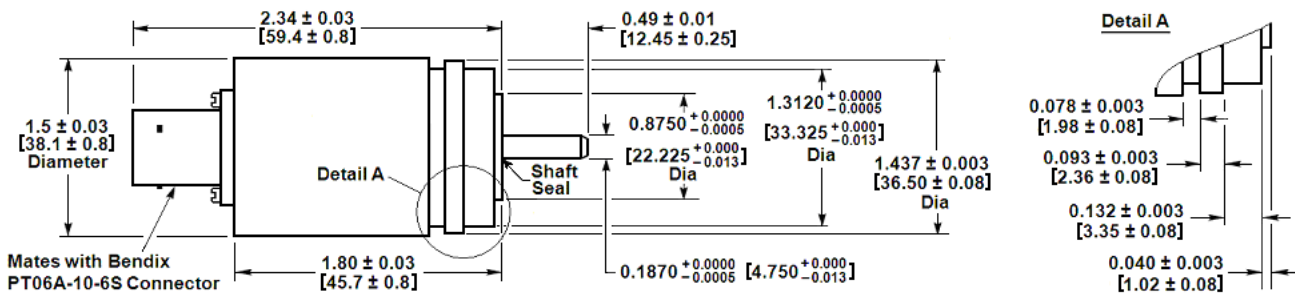


3.2 LVDT (HCI Series) Dimensions

Parameter	HCI 125	HCI 250	HCI 500	HCI 1000	HCI 2000	HCI 5000
Main body length "A"	2.50 [63.5]	3.84 [97.5]	5.03 [127.8]	7.29 [185.2]	10.68 [271.3]	19.7 [500.4]
Core length "B"	1.10 [27.9]	1.80 [45.7]	3.00 [76.2]	3.80 [96.5]	5.00 [127.0]	6.2 [157.5]



3.3 RVDT (R36AS) Dimensions



4. Installation

NOTE: Read all installation instructions in this manual prior to attempting any installation procedures.

The following materials are required for installation of the CTS-420 system:

- HCI LVDT or R36AS RVDT transducer (supplied)
- Amphenol PT06A-10-6S mating connector plug (supplied)
- Interconnect cable (available for separate purchase, or self-constructed)
- Loop power supply (available for separate purchase)
- Loop current indicator (not supplied)

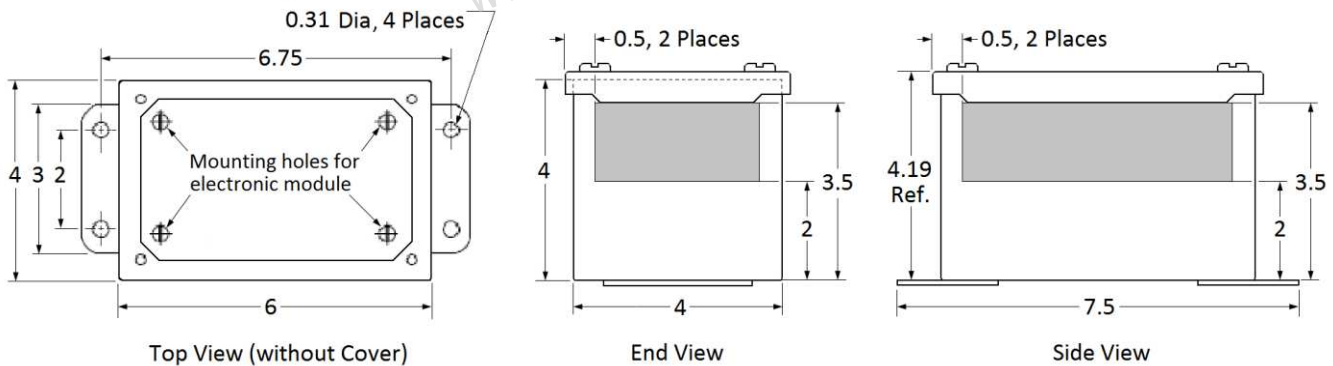
4.1 Suggested Installation Sequence

- Step 1: Read all instructions
- Step 2: The electronic transmitter module contains unprotected circuitry and some type of enclosure is highly recommended to prevent damage
- Step 3: Mount transducer (must be adjustable for calibration)
- Step 4: Connect transducer to transmitter using interconnect cable (purchased or self-made)
- Step 5: Perform calibration and adjust as necessary

4.2 Transmitter module Installation into optional enclosure

NOTE: The CTS-420 electronic module must be installed in an enclosure suitable for the environment in which it is to be used. The maximum recommended length of cable between the sensor and the electronics is 25 feet.

For indoor use, an optional JIC-type enclosure is available. The drawings below show the mounting information. This box is supplied without holes or knockouts; all holes should be made prior to CTS-420 electronic module installation into the box. To avoid mechanical interferences with the cover lip, cover screws, or electronic boards, holes for 1/2 inch conduit hubs or adapters should be located so that their largest diameters are within the shaded areas shown on the drawings below.



5. Connections

CAUTION Read these instructions thoroughly before making any connections to the CTS-420. Serious damage to the equipment may result from improper wiring.

The cables used in the CTS-420 installation should be enclosed in conduit. For outdoor applications where the enclosure might be exposed to oil, water, or other liquids, use rigid conduit with rain-tight conduit hubs, or liquid-tight (Type LF or EF) flexible conduit. Follow NEC (National Electric Code) and NEMA (National Electrical Manufacturers Association) practices which apply to your operating conditions and environment.

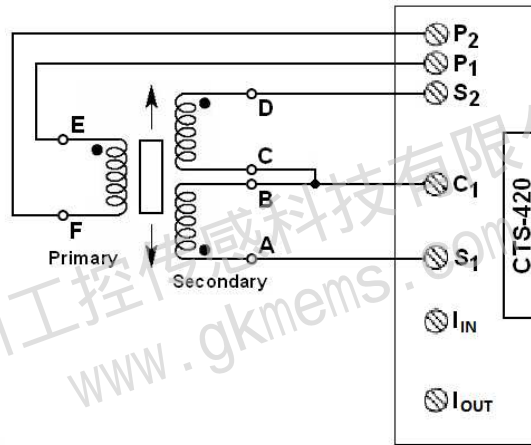
5.1 Transducer to Signal Conditioner/Transmitter Connection

NOTE: The maximum allowable cable length between the transducer and the electronic transmitter is 25 feet.

An optional interconnect cable with the connector plug already installed is available, part number 04290417-000. If you elect to construct your own cable, an Amphenol PTO6A-10-6S (or equivalent) connector mating plug is supplied to connect the transducer to a 5-conductor cable (Belden #8786 or equivalent is recommended). Refer to the schematic below, the datasheet supplied with the transducer, and the drawings in Section 3 herein. In both cases, it is the user's responsibility to ensure that the cable shielding and insulation are suited to the environment and operating conditions of the application.

Wires connected to the transducer secondary windings (Signals) over a few feet long should be shielded since they may be sensitive to noise pickup. The best place to connect the shield is to the shell of the transducer connector, if the transducer is going to be earth-grounded in the application. Otherwise, the cable shield can be grounded to Terminal P1 of the transmitter module. The shield must not be connected to both P1 and the transducer connector shell unless the LVDT case and the core are completely electrically isolated from earth ground or from any other electrical grounds. The wires connected to the transducer primary are not as sensitive and are not ordinarily shielded. However, if the transducer is located in an extremely (electromagnetically) noisy environment, the primary wires should be shielded separately from the secondary wires. In any case, it is undesirable to have the primary and secondary wires within the same shield as cross-coupling would be detrimental to the electrical performance of the system.

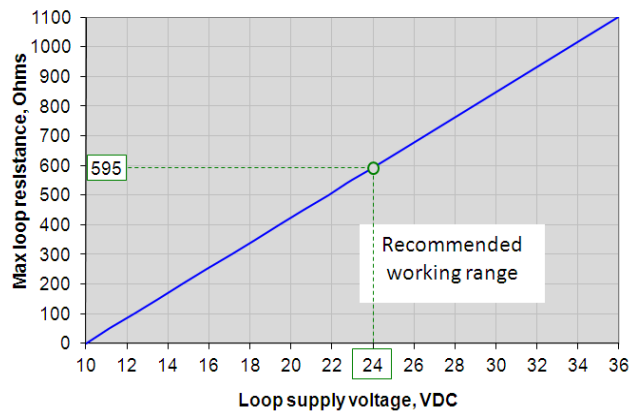
Connect the transducer as shown on the schematic below:



NOTE: Although the above diagram shows an LVDT, the wiring for an RVDT is the same.

5.2 Loop Supply to Signal Conditioner/Transmitter Connection

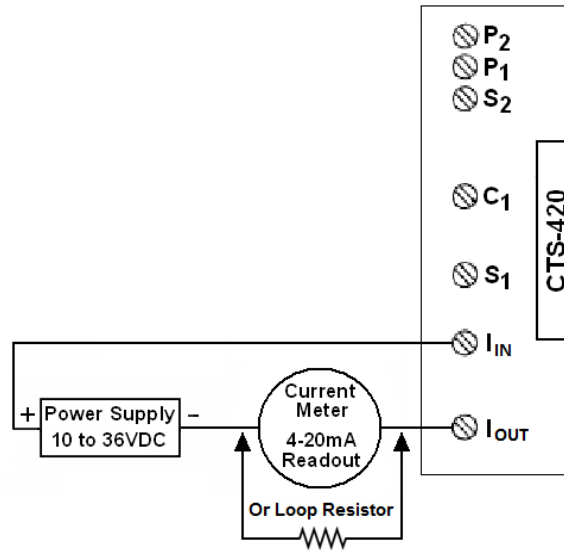
The CTS-420 operates from an external 10 to 36VDC loop supply (available for separate purchase). For any given loop supply voltage, the loop resistance (or meter/readout internal sensing resistance) must not exceed the limit shown in the graph below:



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Connect the loop power supply and your indicator (meter, readout, or resistor) to the conditioner/transmitter according to the schematic below. Observe the polarity: The I_{IN} input is positive and the I_{OUT} input is negative.



6. Calibration

Step 6: The total range (linear or angular) to be measured must be within the linear range of the transducer (Refer to the LVDT or RVDT datasheet). When the calibration procedure has been carried out, the system output should be at 12.0mA at the midpoint of the transducer range, 4.0mA at one end of the range you want to measure, and 20.0mA at the other end.

Step 7: Release the ½ inch hex nuts on the SPAN and ZERO controls (Refer to the sketch of the front panel in Para. 3.1).

Step 8: Adjust both the SPAN and ZERO controls to the middle of their range (about 5 turns from either end).

Step 9: Connect the transducer primary wires to the P1 and P2 terminals. Make sure that the LVDT core is inside the LVDT.

Step 10: Connect the CTS-420 terminals I_{IN} and I_{OUT} to the 2-wire current loop (see Paragraph 5.2) and apply power. Allow a few minute warmup for stabilization.

Step 11: Using wire jumpers, short terminals S1, S2, and C1 together and adjust the ZERO control to measure an output current of 12.0mA.

Step 12: Remove the jumpers from S1, S2, and C1. Connect the transducer secondary wires to the transmitter (Refer to Paragraph 5.1).

Step 13: Position the LVDT core or the RVDT shaft to the “plus” full scale position (end of measuring range in the increasing output current direction, towards 20mA). Adjust the SPAN control for 20.0mA output.

NOTE: If a current increase is desired when the LVDT core or RVDT shaft is moved in the other direction, the polarity can be reversed by interchanging connections S1 and S2.

Step 14: Displace the core to the other end of the measuring range (to the 4mA position) and adjust the ZERO control again for a current output of 4.0mA.

Step 15: Steps 8 and 9 can be repeated again to ensure that the ends of the measuring range are exactly 20.0 and 4.0mA, or as close as possible to 20.00 and 4.00mA.

NOTES:

- If the full linear range of the transducer is not going to be used, the ZERO and SPAN are used to adjust the output so that 4.0 and 20.0mA are obtained at each end of the range to be measured.
- The mechanical null position of the transducer may be adjusted, if needed, so that the 12.0mA output corresponds to the midpoint of the range to be measured.

Step 16: Tighten the lock nuts on the SPAN and ZERO controls.

7. Precautions

DO NOT:

- Apply power while the LVDT core is outside the LVDT;
- Attempt to substitute other transducers for use with the CTS-420 system;
- Drill any holes in the transducer or unnecessary holes in the transmitter for mounting purposes;
- Torque the mounting screws over 35 inch-pounds;
- Use a loop supply voltage outside the recommended range;
- Operate the transmitter with higher loop resistances than specified (see Paragraph 5.2);
- Attempt to separate the transducer and the transmitter electronics by more than 25 feet;
- Use magnetic materials for the LVDT or RVDT mounts.

Be certain to mount the LVDT or RVDT as to minimize friction. If the user provides the enclosure and/or the cables, be certain that they properly protect the system from the environment, and that all cables are properly shielded.

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