TELEX: 90 1963
TELEFAX: (703) 354-0216
TOLL FREE: (800) 833-5828

AREA CODE
703
TELEPHONE
354-3350

DELTA ELECTRONICS

DELTA ELECTRONICS, INC.
5730 GENERAL WASHINGTON DR.
P. O. BOX 11268
ALEXANDRIA, VIRGINIA 22312 - 0268
U.S.A.

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MODEL TCT-N
TOROIDAL CURRENT TRANSFORMER
INSTRUCTION SHEET

INTRODUCTION

The TCT-N series of precision toroidal current transformers provides sample voltages for RF current phase and magnitude measurements on broadcast antenna arrays. These transformers may be combined with any of Delta's standard TCA-N-EX or TCA-N-EXR single scale or TCA-N/N-EXR dual scale RF ammeters for precision RF current measurements.

This instruction sheet provides installation and maintenance information for the TCT-N transformer which is applicable to either the RF current phase and magnitude sample voltage application or the RF ammeter application. Refer to the instruction sheet supplied with the TCA RF Ammeter for installation information applicable to the ammeter enclosure and system operation information.

DESCRIPTION

The TCT-N transformer is assembled in a rectangular aluminum enclosure with a 1.25" diameter insulated clearance hole for the antenna conductor. This clearance enables operation with conductor voltages as high as 14 kV peak (10 kV_{RMS}). Although conductor type, size and placement are generally not critical for the TCT-N transformer, a 0.38 to 0.5" diameter tubular conductor centered in the clearance hole provides optimum voltage capability. The TCA-LS-8 and TCA-LS-11 line sections which increase the TCT-N voltage rating by approximately 50% are available as a factory installed option.

Several versions of the TCT-N transformer are available for different RF current sampling requirements. The TCT-1 transformer provides 0.5 V_{RMS} across a 50 ohm external load for each Ampere of current flowing in the antenna conductor. This model is rated for currents up to 40 A_{RMS}. The TCT-2 transformer provides a 0.25 V_{RMS}/Ampere sample across a 50 ohm external load and is rated for currents up to 80 A_{RMS}. The TCT-3 transformer provides a 1.0 V_{RMS}/Ampere sample across a 50 ohm external load and is rated for currents up to 20 A_{RMS}. The TCT-4 and the TCT-5 transformers are high output, unterminated units which are used only with the 5, 10, 5/10 and 10/20 Ampere TCA RF Ammeters.

The TCT-1 and TCT-2 may be used in the same directional antenna system since they have identical phase and magnitude tracking characteristics. The TCT-3 transformer has different characteristics and should not be mixed with the other two models. Also, the TCT-N transformers should not be mixed with the TCT-N-HV (20 kV_{RMS} rating) or TCT-N-XHV (42.4 kV_{RMS} rating) transformers due to the differences in the toroid inductors used in each design.

INSTALLATION

CAUTION

The TCT-N transformer enclosure must be securely grounded for safe operation. Improper grounding may result in a shock hazard to station personnel.

Locate the TCT-N transformer after the antenna tuning network as the last component. Note that when a TCT transformer for an antenna monitor and a TCT transformer for a TCA RF Ammeter system are installed together, the TCT transformer for the ammeter must be located closest to the tower. The TCT transformer weighs approximately 3.5 pounds and must be properly supported. Securely ground the TCT enclosure by mounting the unpainted bottom surface of the TCT on a 2.25 inch wide minimum ground strap and bonding the strap to the system ground. The TCT mounts with two each 1/4"-20 bolts located on 2.0" centers as shown in Figure 1. Maximum penetration of the bolts into the TCT enclosure is approximately 0.5". Use only brass or other non-magnetic bolts to mount the TCT. For antenna monitor applications, install each TCT with the nameplate arrow pointing toward the tower to provide proper phasing of each transformer. Transformer phasing is not critical for TCA RF Ammeter applications.

The TCT-N provides a 1.25" diameter insulated clearance hole for the conductor. A 0.38 to 0.5" diameter tubular conductor centered in this clearance hole as shown in Figure 1 provides optimum voltage capability of 14 kV peak. Conductors smaller or larger than the recommended size, nontubular conductors, or conductors not centered within this clearance hole will reduce the voltage capability. Delta recommends installing a lightning gap between the TCT and the antenna, and adjusting the gap so the gap arcs first to protect the TCT. The TCT-N adds a small shunt capacity of approximately 5 pF to the antenna transmission line. This shunt reactance will generally be negligible at broadcast frequencies.

Connect the TCT-N transformer to the antenna monitor with a 50 ohm coaxial cable terminated with a Type N male connector or to the TCA RF Ammeter using the factory supplied coaxial cable. Dress the coaxial cable for maximum separation from the antenna conductor and other RF conductors.

The TCT-1, TCT-2 and TCT-3 transformers incorporate internal resistors to provide a 50 ohm source impedance. These internal resistors also terminate the transformer output when the external 50 ohm load resistance is not connected to the TCT. Thus, these transformers may be operated without an external load although continuous operation in this mode is not recommended due to the excess power that must be dissipated by the internal resistors. However, the high output voltage TCT-4 and TCT-5 transformers do not incorporate internal resistors and are terminated only by the meter unit. **The coaxial cable interconnecting the TCT-4 or TCT-5 with the meter unit must not be disconnected when RF current is flowing through the transformer. Cable disconnection on these systems with RF power applied will result in a shock hazard and/or arcing with resultant damage.**

MAINTENANCE

The TCT-N transformer and antenna conductor should be periodically checked and cleaned to remove any dirt or insects that could degrade the high voltage capability of the transformer. Inspect the interior surface of the clearance hole and the exterior surface of the antenna conductor for any signs or arcing or pitting and remove with emery cloth or fine grit sandpaper. Periodically check the tightness of the bolts mounting the TCT and the tightness of the Type N connector. Also, periodically remove any silicon grease residue which may appear around the bushing.

The toroid and terminating resistors of the TCT-N transformer are encapsulated within a urethane foam inside the enclosure and are not field repairable. Note that since the toroid winding shunts some or all of the internal resistors depending on TCT type, a DC resistance test of the unit will not necessarily indicate internal resistor variations. The Type N connector may be replaced if damaged. Remove the four mounting screws and gently pull the connector to access the single wire connection to the connector. Replace the connector with a UG-58/U or equivalent receptacle (Delta part number 612-0006). If the bushing is damaged by arcing, return the TCT to the factory for bushing replacement. Contact our Customer Service Department to obtain a return authorization number prior to returning a transformer for evaluation of performance or for repair.

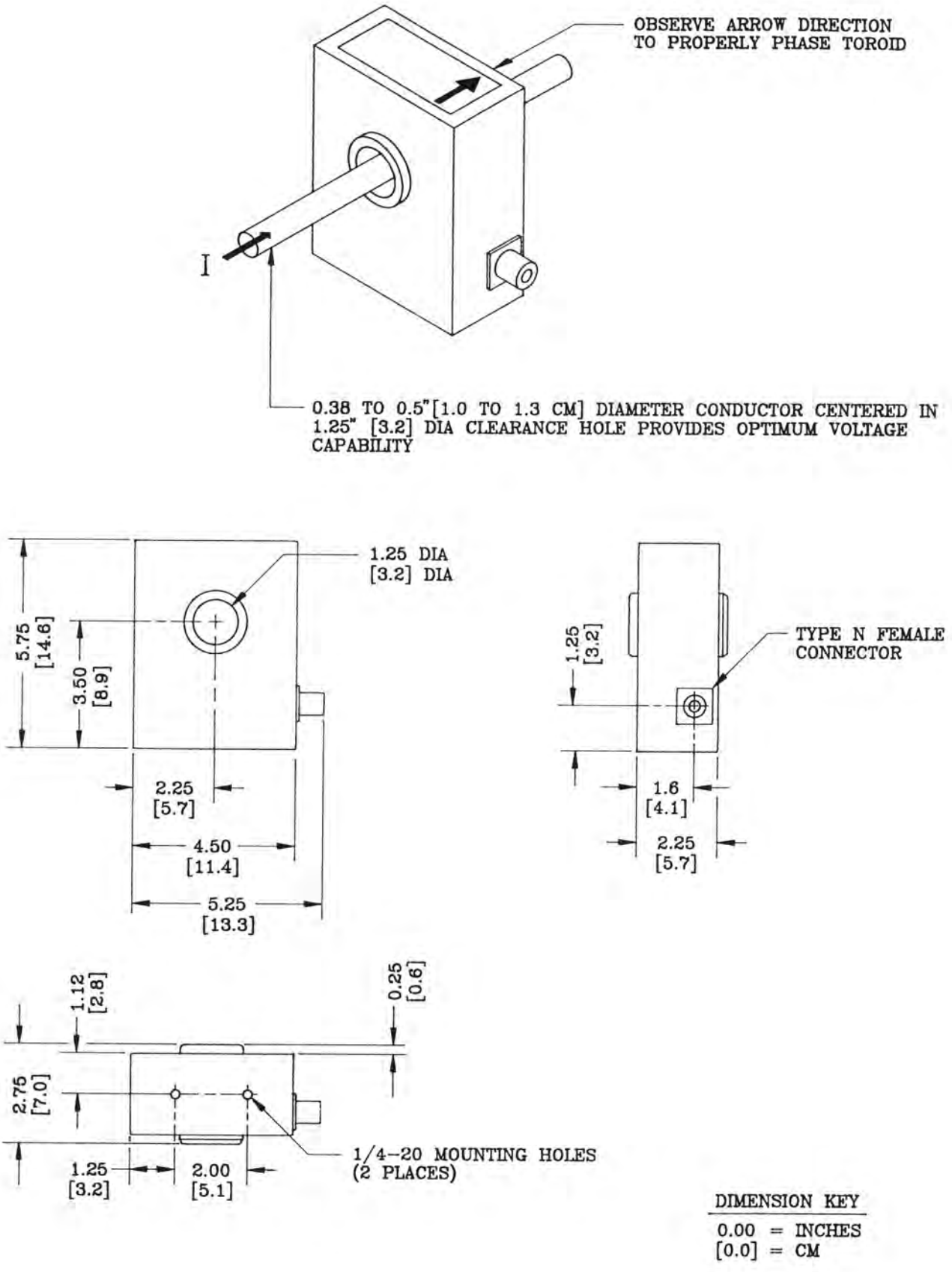

FIGURE 1
TCT-N INSTALLATION DIMENSIONS

SPECIFICATIONS

Frequency Range:
0.5 to 2 MHz

Sensitivity*:

TCT-1:	0.5 V/Ampere
TCT-2:	0.25 V/Ampere
TCT-3:	1.0 V/Ampere
TCT-4:	1.0 V/Ampere
TCT-5:	2.0 V/Ampere

Source Impedance:
50 Ohms

Current Range:

TCT-1:	0 - 40 Amps
TCT-2:	0 - 80 Amps
TCT-3:	0 - 20 Amps
TCT-4:	0 - 20 Amps
TCT-5:	0 - 10 Amps

Absolute Magnitude Accuracy:
±2%

Absolute Phase Accuracy :

TCT-1 and -2:	±2°
TCT-3:	±3°

Magnitude Tracking Accuracy:
±1%

Phase Tracking Accuracy :

TCT-1 and -2:	±0.5°
TCT-3:	±1°

Insulation:
14 kV peak (10 kV_{RMS})
Optional TCA-LS-8 or TCA-LS-11 line section increases voltage rating to 21 kV peak (15 kV_{RMS})

Electric Field Rejection:
>100 dB

Size and Weight:
5.25 W x 5.75 H x 2.25 D inches, 3.5 lbs.
(13.3 W x 14.6 H x 5.7 D cm, 1.6 kg)

** When terminated in external 50 ohm load. Other sensitivities and corresponding RF Ammeter current ranges available on special order.*

The TCT-4 and TCT-5 transformers are supplied only with TCA-5, -10, -5/10, and -10/20 RF Ammeters and are not characterized for absolute phase accuracy and for phase tracking accuracy.

CERTIFICATE OF WARRANTY

Delta Electronics, Inc. warrants to Purchaser that the product it delivers is free of defects in materials and has high standards of quality and workmanship. This warranty applies to the period of one year from the date of delivery.

Delta Electronics, Inc. will, at its own expense and, after written notice has been received and acknowledged by Delta, repair or replace any product which is defective (according to the usage of the trade) during the above designated warranty period when Delta Electronics, Inc. receives such product at its Alexandria address with shipment costs prepaid by Purchaser.

Delta Electronics, Inc. is not liable for consequential damages.

No other warranty is expressed or implied.