



# **ANNULAR TORQUE TRANSDUCER AND AMPLIFIER**

FOR USE WITH ELECTRONIC TRANSDUCER SYSTEM (E.T.S)

**OPERATORS HANDBOOK (PART NO. 34147)**  
ISSUE 3

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## ANNULAR TORQUE TRANSDUCER AND AMPLIFIER

### INTRODUCTION

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The ETS Annular Torque Transducer comes with its own matching amplifier module and share the same serial and model number. Transducers can be calibrated in either Nm, lbf ft or lbf ins as standard, but other units of Torque are available i.e cNm, dNm, Kgf cm and Kgf m.

The transducer torsion tube is made from heat treated stainless steel on to which are bonded strain gauges which are wired to form a wheatstone bridge. The strain gauges vary their resistance in direct proportion to the Torque applied. The small change in resistance causes a change in voltage across the bridge that is then amplified by the amplifier module.

The amplifier module is calibrated to each transducer and at its heart is an Instrumentation Amplifier. Housed within the amplifier module are the bridge balance potentiometers, gain setting potentiometer and bridge test potentiometer along with the range and decimal point coding resistors. The whole is potted in silicon rubber within a plastic shell.

The amplifier operates from supplies of a +/- 10v and a constant current of 20mA which is delivered to the bridge via the zero network. The output voltage from the amplifier is fed to the internal circuitry of the ETS.

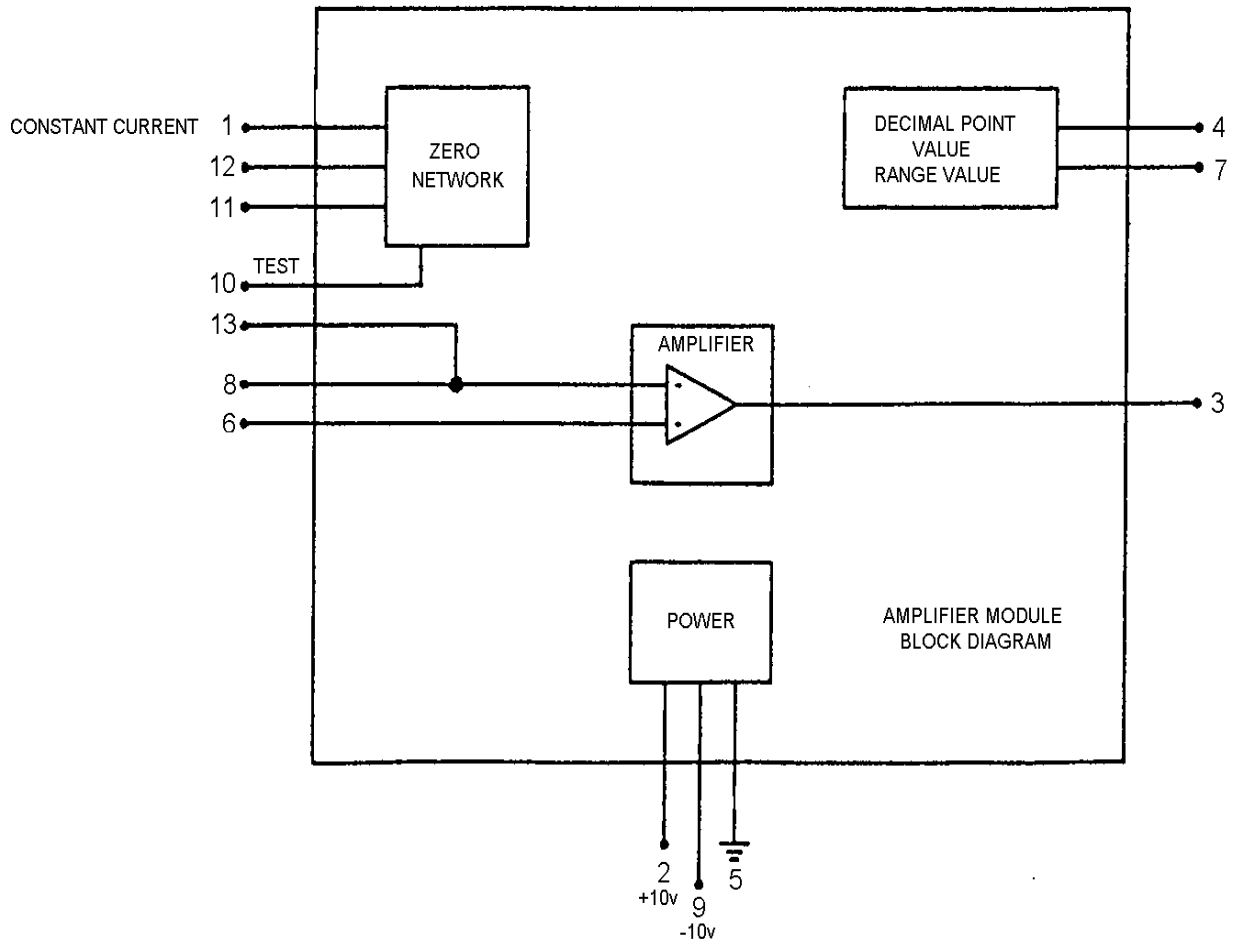
### SPECIFICATION

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Accuracy	See calibration cetificate supplied with transducer.
Amplifier Output	1.0000 volts Full Scale Defection for Nm. 1.3558 volts Full Scale Defection for lbf ft. 1.1299 volts Full Scale Defection for lbf ins. 0.9807 volts Full Scale Defection for Kgf m
Amplifier Power Requirement	+/- 10v D.C. Regulated..
Constant Current	20mA +/- .01 mA
Operating Temperature Range	-10°C - +50°C
Storage Temperature Range	-20°C - +70°C
Temperature Co-efficient	<+/- 0.01%/°C. Full Scale Defection on zero <+/- 0.03%/°C. Full Scale Defection on span
Maximum working overload	120% of rated capacity
Absolute maximum torsion	150% of rated capacity

## AMPLIFIER AND TRANSDUCER CONNECTIONS

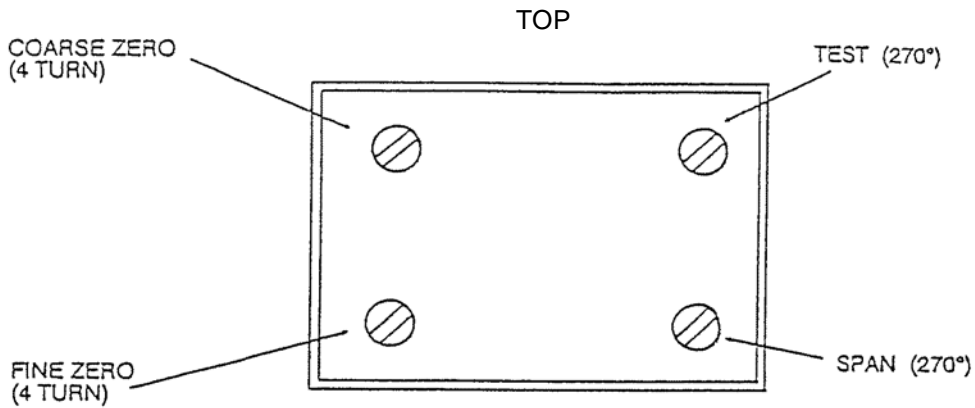
### AMPLIFIER



- Pin 1 Constant current 20mA.input to amplifier
- Pin 2 +10 volt supply
- Pin 3 Amplifier output
- Pin 4 Select decimal point output to ETS.
- Pin 5 0v common, (Connected to Pin F of Transducer via Transducer lead).
- Pin 6 Input from Strain Gauge Bridge, (Connected to Pin A of Transducer via Transducer lead).
- Pin 7 Select Range output to ETS.
- Pin 8 Input from Strain Gauge Bridge, (Connected to Pin B of Transducer via Transducer lead).
- Pin 9 -10 volt supply
- Pin 10 Test switch input, Shorted to Pin 11 when Test button pressed.
- Pin 11 Supply to Bridge from amplifier, (Connected to Pin D of Transducer via Transducer lead)
- Pin 12 Supply to Bridge from amplifier, (Connected to Pin C of Transducer via Transducer lead).
- Pin 13 Not Used.

**AMPLIFIER CONTROLS**

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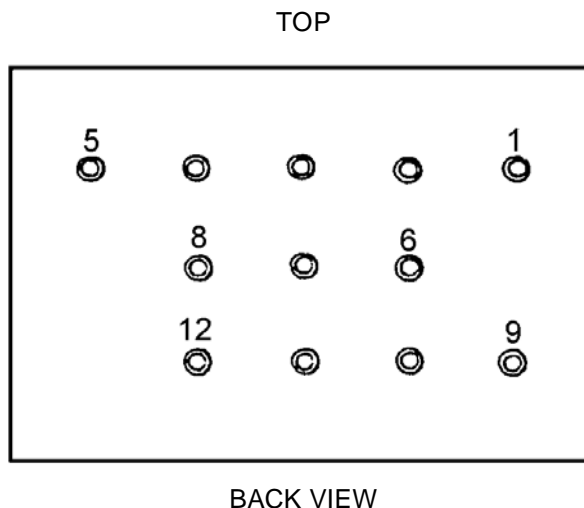


The adjustments available are as follows:-

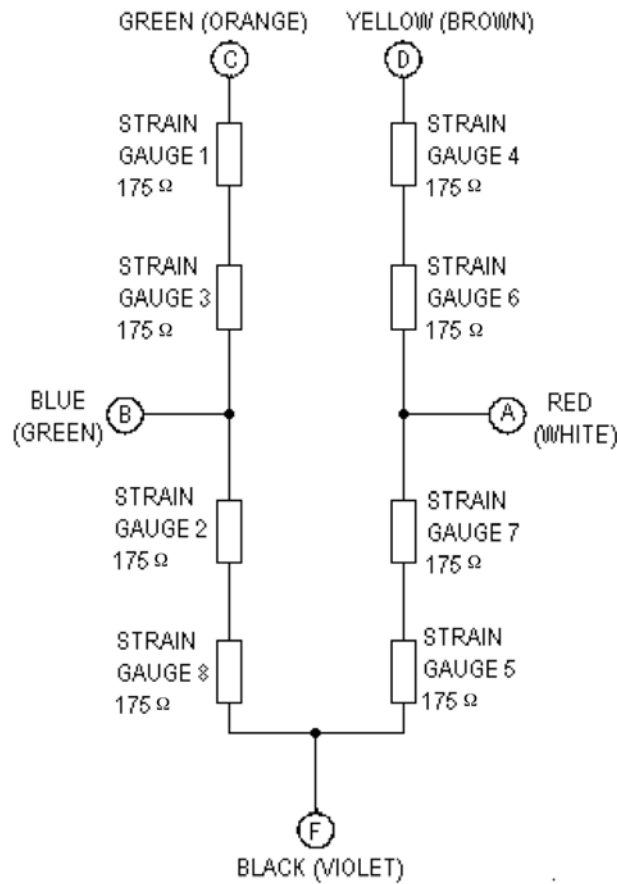
- Fine Zero            To remove any temperature drift effect or non zero reading.
- Coarse Zero        Used for initial bridge balancing, this potentiometer is covered by the label and should not need adjustment.
- Test                 When the TEST switch on the ETS back panel is pushed and held in, the ETS display should read the full scale capacity to which the transducer has been calibrated. This is only for indication purposes only and not a calibration check. This potentiometer is covered by the label and should only need adjustment if the span potentiometer is adjusted.
- Span                 This potentiometer is used to calibrate the amplifier to the transducer when the full scale Torque is applied to the transducer. This potentiometer is covered by a green tamper proof label and should only need adjustment if recalibrating the transducer.

**AMPLIFIER PIN LAYOUT**

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**ANNULAR TORQUE TRANSDUCER WIRING DIAGRAM**



NOTE: Colours in brackets refer to transducers pre August 2000.

RESISTANCE BETWEEN TERMINALS	
A TO F	350 OHMS
B TO F	350 OHMS
C TO F	700 OHMS
D TO F	700 OHMS
C TO D	1400 OHMS

BRIDGE SIGNALS	
A	SIGNAL OUT
B	SIGNAL OUT
C AND D	POSITIVE EXCITATION
F	NEGATIVE EXCITATION

## ANNULAR TRANSDUCER TO PNEUTORQUE CONVERSION CHART

Units Of Torque	Pneutorque Model	Output Torque of Pneutorque	Annular Transducer capacity	Model Number
lb.ft N.m	PT1	550 lb.ft 750 N.m	1000 lb.ft 1000 N.m	50071.ETS 50070.ETS
lb.ft N.m	PT1A	900 lb.ft 1200 N.m	1000 lb.ft 1500 N.m	50071.ETS 50072.ETS2
lb.ft N.m	PT2	1250 lb.ft 2700 N.m		
lb.ft N.m	PT5	2000 lb.ft 2700 N.m	2500 lb.ft 2500 N.m	50073.ETS 50074.ETS
lb.ft N.m	PT6	2500 lb.ft 3400 N.m		
lb.ft N.m	PT7	4500 lb.ft 6000 N.m	5000 lb.ft 5000 N.m	50075.ETS 50076.ETS
lb.ft N.m	PT9	7000 lb.ft 9500 N.m	7000 lb.ft 10000 N.m	50077.ETS2 50078.ETS
lb.ft N.m	PT11	12500 lb.ft 17000 N.m	10000 lb.ft 10000 N.m	50082.ETS 50081.ETS
lb.ft N.m	PT13	35000 lb.ft 47500 N.m	50000 lb.ft 50000 N.m	50080.ETS 50085.ETS
lb.ft N.m	PT14	60000 lb.ft 81500 N.m	100000 lb.ft 100000 N.m	50154.ETS 50143.ETS

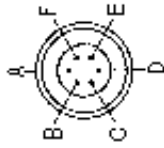
## TORQUE TIGHTENING FOR REACTION PLATE BOLTS

<u>BOLT SIZE</u>	<u>lb.ft</u>	<u>N.m</u>
2 BA	7	9
¼ BSF	14	19
3/8 BSF	55	75
M 5	9	12
M 6	13	17.5
M 8	32	43
M 10	61	83
M 12	115	155
M 16	230	310

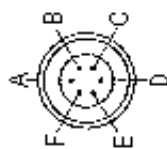
**TRANSDUCER LEAD FOR ETS (not included)**

NOTE: COLOURS IN BRACKETS  
REFER TO TRANSDUCER  
LEADS PRE AUGUST 2000.

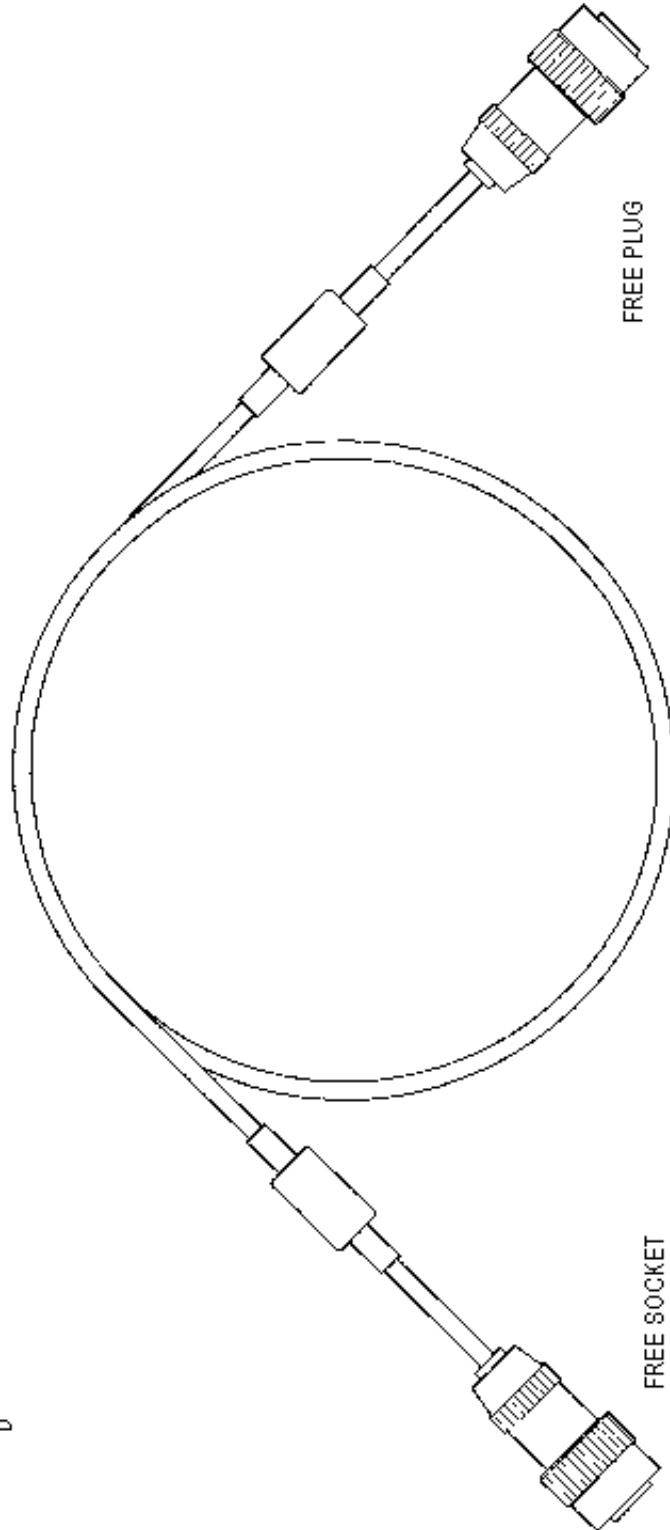
CABLE CONNECTORS	
A -	RED (WHITE)
B -	BLUE (GREEN)
C -	GREEN (RED)
D -	YELLOW
E -	
F -	BLACK (BLUE)



FREE PLUG VIEWED  
FROM CABLE END



FREE SOCKET VIEWED  
FROM CABLE END



**APPLICATION OF ANNULAR TRANSDUCERS ON HANDTORQUE GEARBOXES**

To appreciate the operation of an Annular Transducer on a Handtorque gear box, users need to be aware of the following:-

$$\text{TORQUE ON TRANSDUCER (T reaction)} = \text{OUTPUT SQUARE DRIVE TORQUE (T output)} - \text{INPUT TORQUE (T input)}$$

The reason for this is that the annular transducer measures the reaction torque, not the applied torque and part of the reaction torque is taken by the operator when the input to the multiplier is loaded

For the Handtorque gearbox shown below there are three external torques applied.

- 1) The torque applied by the operator through the torque wrench.  
(  $T_{\text{input}} = F_{\text{in}} \times L_{\text{in}}$  )
- 2) The torque applied to the annulus by the reaction force acting on the reaction plate. (  $T_{\text{reaction}} = F_{\text{r}} \times L_{\text{r}}$  )
- 3) The resistive torque of the fastener applied to the gearbox through the drive square. (  $T_{\text{output}}$  )

This phenomenon only exists while the multiplier input is being loaded, so if an Anti Wind-up Ratchet is used, measured torque will equal output torque when the input torque has been released.

