CABLE TENSIOMETER ATTACHMENTS

FOR ISO 2000

OPERATORS HANDBOOK (PART NO. 34087)

ISSUE 7

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INTRODUCTION

By using the specially designed Attachments the ISO 2000 test rig can be quickly adapted to provide test facilities for Cable Tensiometers.

Once adapted the self locking gearbox provides a quick and easy method of attaining and retaining the tension within the cable.

NOTE: *The tension induced in the cable is calculated from the calculation below.*

$$\text{Tension in cable} = \frac{\text{Torque Applied}}{(\text{Radius of quadrant} + \frac{1}{2} \text{ the diameter of the cable})}$$

OPERATING INSTRUCTIONS

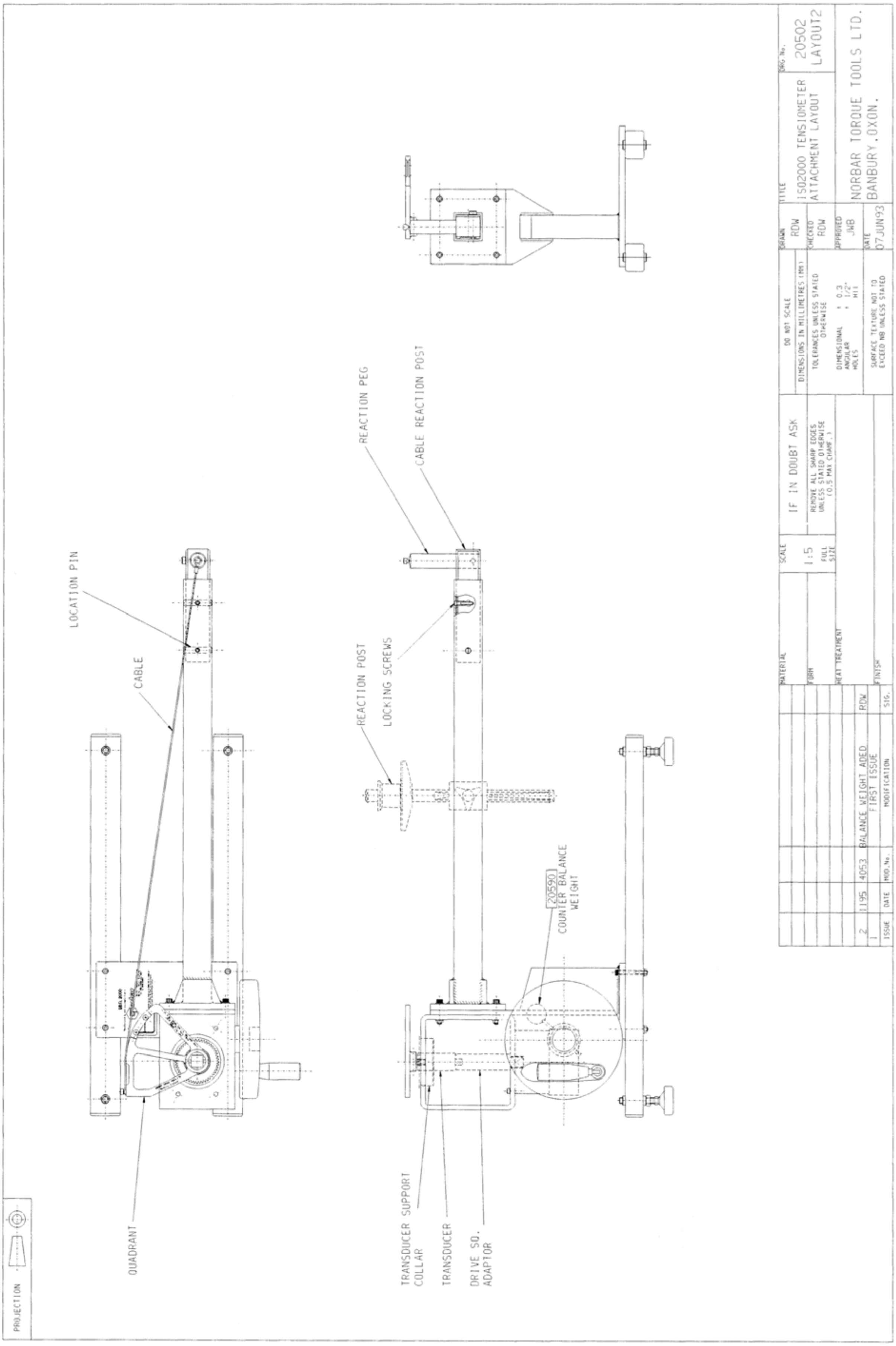
CHANGES TO ISO 2000 TEST RIG

Before you start using the rig to calibrate tensiometer attachments, the balance weight (20590) needs to be fitted to the torque application handwheel, see drawing 20502.LAYOUT2 on page 3 for position.

For this you will need a flat end screwdriver, and a 5mm A/F Allen Key. Use the screwdriver to prise off the spindle cover, remove the Socket Cap Screw with the Allen Key and then remove the hand wheel. Fit the balance, with the outer weight being opposite the handle (as shown), refit the hand wheel in reverse order.

ASSEMBLY OF ATTACHMENTS ON ISO 2000 TEST RIG

1. Select most suitable torque transducer for tension to be applied (use calculation on page 2). Mount transducer in ISO 2000 rig with female square uppermost. Use square drive adaptors as required.
2. Connect transducer to display instrument.
3. Fit appropriate support collar over transducer and twist to lock transducer in.
4. Remove torque wrench reaction post from ISO 2000 rig and fit cable reaction post onto end of arm.
5. With reference to the table on page 4 select the appropriate quadrant, reaction peg and test cable.
6. Fit quadrant, peg and cable as shown in diagram on page 3.


LOCATION PIN
CABLE
QUADRANT
REACTION PEG
CABLE REACTION POST
REACTION POST
LOCKING SCREWS
20590
COUNTER BALANCE WEIGHT
TRANSDUCER SUPPORT COLLAR
TRANSDUCER
DRIVE SQ. ADAPTOR
PROJECTION
IF IN DOUBT ASK
REMOVE ALL SHARP EDGES UNLESS STATED OTHERWISE (0.5 MAX CHAMF.)
DO NOT SCALE
DIMENSIONS IN MILLIMETRES (MM)
TOLERANCES UNLESS STATED OTHERWISE
SCALE 1:5
2 1195 4053 BALANCE WEIGHT ADED RDW
1 FIRST ISSUE
ISSUE DATE MOD.No. MODIFICATION SIG.
DRAWN RDW
CHECKED RDW
APPROVED JWB
DATE 07JUN93
TITLE IS02000 TENSIOMETER ATTACHMENT LAYOUT
DRG. No. 20502 LAYOUT2
NORBAR TORQUE TOOLS LTD. BANBURY. OXON.

Cable Size	Cable	Quadrant	Quadrant Radius	Trans-ducer	Adaptor	Collar	Reaction Peg	Square Drive Adaptor
9.0 8.0	20502.36 20502.37	20581	0.22543 m or 8.875"	50043.ETS or 50013.ETS	20502.49	20502.53	20502.30	21214
9/32" 7.0 1/4" 6.0 7/32" 5.3 3/16" 5.0 5/32" 4.0 1/8" 3.0	20552.1 20502.38 20553.1 20502.39 20554.1 20502.40 20555.1 20502.41 20556.1 20502.42 20557.1 20502.43	20581	0.22543 m or 8.875"	50031.ETS or 50012.ETS	20502.48	20502.52	20502.30	
3/32" 2.5 1/16" 1.6	20558.1 20502.44 20559.1 20502.45	20580	0.15121 m or 5.953"	50028.ETS or 50008.ETS	20502.46	20502.51	20502.31	

20502.2 Cable reaction post required for any or all cable tensiometers (1 only required).

CALCULATION OF REQUIRED TORQUE

The torque required to attain the desired tension can be calculated using a formula. The constant in the formula depends on the size of the quadrant being used.The following table indicates which constant to use for each cable range.

Cable Range {mm(ins)}	Formula to Calculate Torque
3-9 mm (1/8" – 9/32")	Torque (Nm) = Tension(N) x radius of centre cable line (metres) = Tension (N) x (0.22543 + rad.of cable(m)) Torque(lbf.ft) = Tension (lbf) x Radius of centre cable line (feet) = Tension(lbf) x (0.7395 + rad of cable(ft))
1.6 – 2.5 mm (1/16" – 3/32")	Torque (Nm) = Tension(N) x radius of centre cable line (metres) = Tension (N) x (0.15121 + rad.of cable(m)) Torque(lbf.ft) = Tension (lbf) x Radius of centre cable line (feet) = Tension(lbf) x (0.4957 + rad of cable(ft))

CALIBRATION OF CABLE TENSIOMETER

There are 2 ways to calibrate cable tensiometers using the ISO 2000 and attachments. Each method gives different results. The tensiometer can be calibrated using either method.

METHOD 1

1. Calculate torque to induce tension in cable for each calibration point required.
2. Apply load of approximately 50% to 70% of lowest calibration point.
3. Adjust tensiometer for zero and attach tensiometer to the centre portion of the test cable. Increase load in cable to first calibration point.
4. Once you have a steady reading on the torque readout note the reading on the tensiometer.
5. Increase tension in cable to next calibration point, obtain a steady reading of torque and note the reading on the tensiometer. Repeat for all required calibration points.
6. Release the tension in test cable then remove tensiometer.

Note: *It is preferable to support the tensiometer (in one hand or on a support column) so as its weight does not affect the results.*

METHOD 2

1. Calculate torque to induce tension in cable for each calibration point required.
2. Apply load in cable for desired calibration value, and obtain a stable reading. See notes A and B below.
3. Attach the cable tensiometer. The torque figure will increase. Do not re-adjust the tension.
4. Once you have a steady reading on the torque readout note the reading on the tensiometer.
5. Remove the tensiometer from the cable.
6. Apply load for next calibration point.
7. Repeat steps 2 to 6 for each calibration point.

NOTE A To obtain a steady tension in the test cable, firstly apply tension of approximately 10% above the desired tension for 20 seconds then reduce tension to desired calibration value. This will eliminate any back lash in the system.

WARNING: DO NOT EXCEED 120% OF TRANSDUCER RATED CAPACITY OR MAX CAPACITY OF CABLE.

NOTE B An alternative method of obtaining a steady tension in the test cable is to apply required tension to the cable and leave for approximately 2 minutes. The system will relax and the tension will drop off a small amount. Re-adjust after 2 minutes to the desired calibration value.

NOTE C It is preferable to support the tensiometer so as its weight does not affect the results.

WHICH METHOD TO USE

A tensiometer is usually only a comparative measurement device (i.e. there are no units of measurement on its scale) so could be calibrated by either or both methods depending on how it is to be used. There can be very large differences (particularly at the lower end of the scale) between the 2 methods.

To our knowledge tensiometer manufacturers calibrate tensiometers by hanging weights on the end of a test cable hung from the roof of the laboratory. With this method one end of the cable is fixed (roof), the other is free to move (weights), thus, when the tensiometer is attached to the cable it does not affect the tension in the cable. Method 1 will give equivalent results to this as the tension in the cable is induced with the tensiometer fitted to it.

Method 2 is relevant if you wish to measure the tension in a pre-tensioned cable, which is fixed at both ends. The act of attaching the tensiometer will induce further tension in the cable but as the measurement made with and the calibration of the tensiometer is only a comparative measure this should not be a problem.

Although method 2 would seem the better method to test cables in situations with fixed ends, such as aircraft where the cable generally has fixed load points at both ends, it seems that tensiometers used to measure tension in cables in these applications are calibrated using the roof, cable and weights method.