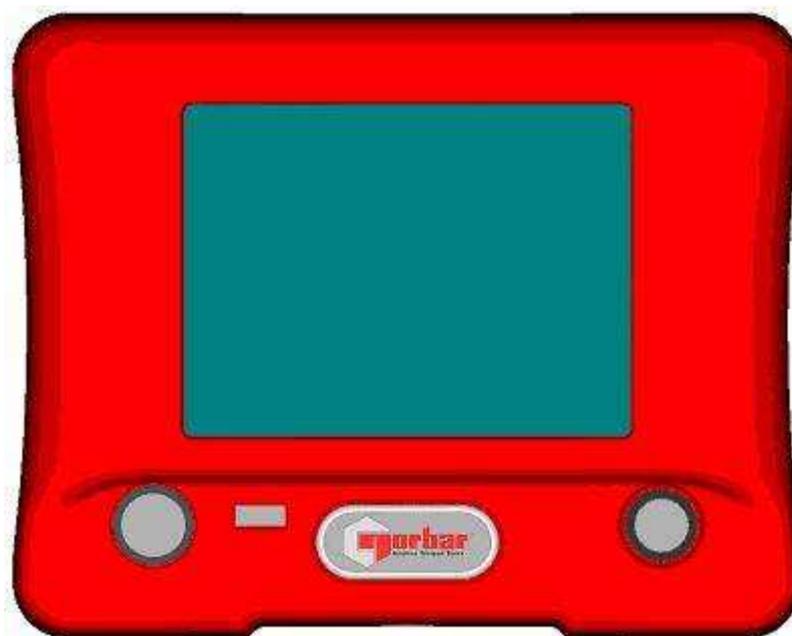




T-Box

OPERATOR'S HANDBOOK (Part No. 34335) Issue 4
Original Instructions (ENGLISH)
FOR USE WITH T-BOX FITTED WITH (VERSION 1.0.2.X) SOFTWARE



PART NUMBERS COVERED BY THIS HANDBOOK

43236 T-Box

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CONTENTS

	<u>PAGE</u>
Introduction	2
Software Compatibility	2
Features and Functions	3
Quick Start	4
Before Use	5
Preparation	5
Set Up for use	7
Measure	8
Preparation, Transducer	8
Tool, Work Id	9
Target, Units, Zero display	10
Mode, Take Results (Calibrate)	11
Data Logging	12
Save Results	13
View / Delete Results, Mains / Battery	14
Setup	15
Target	16
Tool Templates, My Tools	17
Non-Smart Transducer Setup, USB in/out	18
Instrument Setup (Language, Modes, Sleep After, Password, Date & Time, Angle Display, Units, Serial Port)	19
Specification – General	24
Specification - Transducer Interface	25
Specification - Ancillaries	26
Specification - Serial Port	28
Specification - USB	29
Specification – Modes	30
Specification – Targets	33
Specifications – Hand Torque Tool Classification	34
Maintenance	36
Trouble Shooting	37
Glossary of Terms	39

Disposal



This symbol on the product indicates that it must not be disposed of in the general waste.

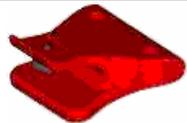
Please dispose of according to your local recycling laws and regulations.



For more information see Maintenance section.

INTRODUCTION

The T-Box is a hand held torque measuring instrument with a user friendly colour touch screen interface. Both hand and powered torque tools can be measured, calibrated or viewed in graph mode. The comprehensive instrument functions in 12 languages, all common torque units, pre-loaded Tool calibration templates and has a large measurement memory for storage of test results. T-Box features a USB interface to the Torque Data Management System (TDMS) software for data archiving of Test, Calibration and Graphical results on a PC.

Parts Included		Part Number	Quantity
T-Box Instrument.		43236	1
Stand		39411.RED	1
Bolts for stand (M10 x 25).		25355.25	2
USB flash drive (Handbooks / Software).		61129	1
Quick reference guide.		34336	1
Power supply adapter.		38877	1
USB lead to PC.		39483	1
Serial data lead.		39264	1
Neck strap screws.		25498	2
Neck strap clip.		38881	2
Neck strap spacer.		38882	2
Neck strap.		38883	1
Hex Key for neck strap.		24933	1
Stylus.		39484	1
Power cord.		-	1
Calibration Certificate.		-	1
T-Box carry case.		26775	1

Accessories Available	Part Number
T-Box to 10 way lead, for Norbar Rotary Transducers.	60216.200
T-Box to 6 way lead, for Norbar Static & Annular Transducers.	60217.200
T-Box to no connector (for non-Norbar transducers).	60223.200
Extensive range of torque transducers.	Contact Norbar
Serial Data Lead Kit.	60248

NOTE: - The suffix after the lead part number indicates the length of the lead in cm, thus XXXXX.200 = 2 metres. If Transducer leads are required of a non-standard length, the new suffix must be added to the part number when ordering (to the nearest metre).

SOFTWARE COMPATIBILITY

T-Box	TDMS	Reason for upgrade
Up to software version 1.0.1.X	1.0.X	-
From software version 1.0.2.X	2.0.X	Improved data features

FEATURES AND FUNCTIONS

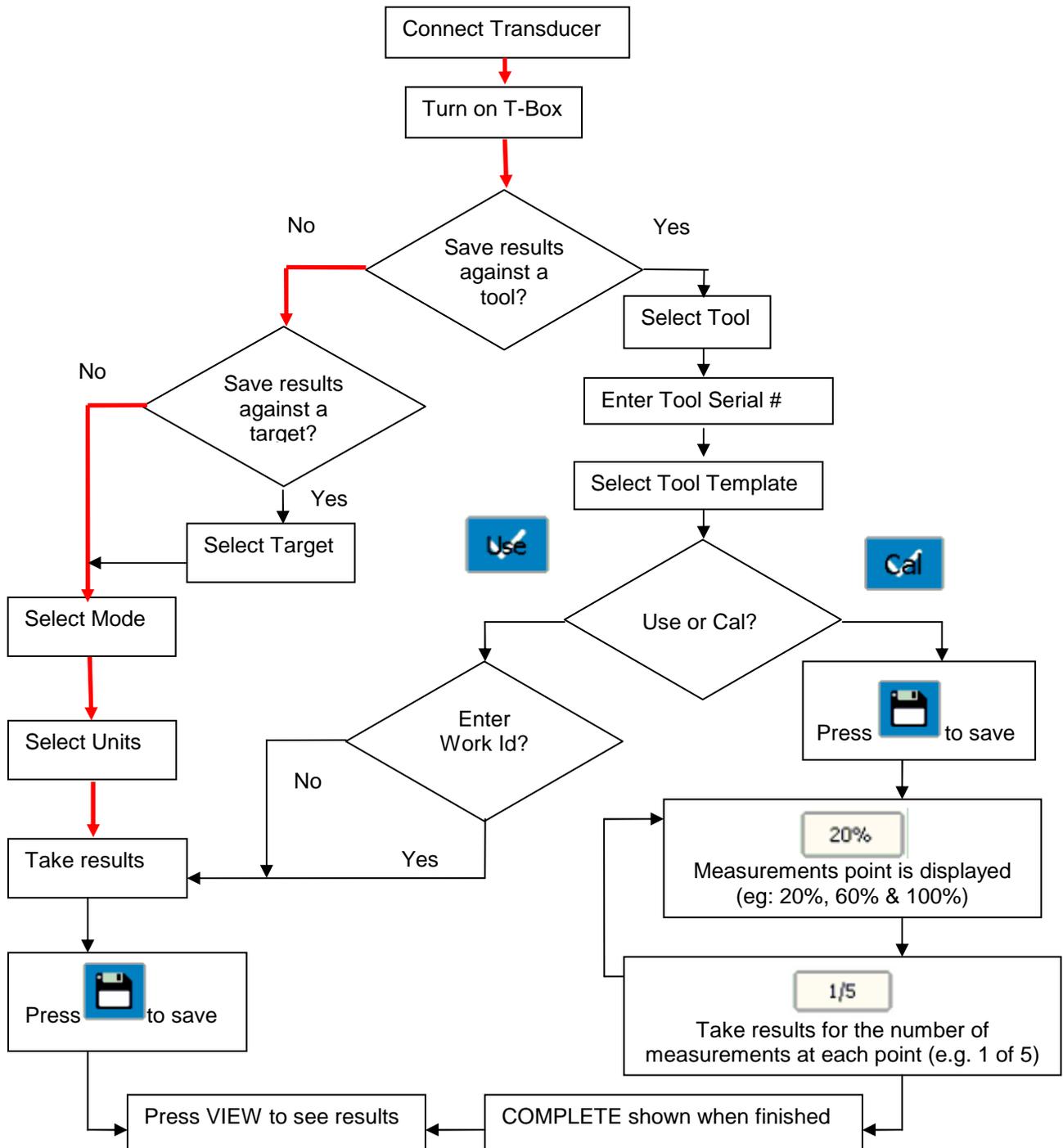
- 5.7" Colour touch screen with clear icons for ease of use.
- Hand held with neck strap or bench mounted.
- 4 transducer inputs with ergonomic front panel selection switch.
- Automatically recognises any 'SMART' Norbar transducer.
Can also work with most mV/V transducers from Norbar or other manufacturers.
- 5 digit resolution for all Norbar transducers.
- Operational from internal rechargeable battery or Power supply adaptor.
- Multiple Targets to indicate status of torque & angle results. The targets status is shown as symbols and background colours on the display, as well as outputs on the ancillaries connector and serial port.
- Continuous Data logging of Torque or Torque & Angle results for transfer to TDMS.
- Ability to link targets for applications that require tightening in a sequence.
- Selectable frequency response for each mode of operation.
- Password protection of all selectable features to virtually eliminate operator induced errors.
- Ancillaries connector with analogue output & GO/NO GO control for external equipment.
- Serial Port for data output to a PC or printer.
- 56MB results memory. An example of memory storage:

Item	Memory each	Example of storage
Instrument set up	5KB	5KB
Transducer	2KB	40 transducers = 80KB
Audit (20 results)	6KB	1000 sets of 20 results 6,000KB
Targets (20 off)	2KB	100 targets = 10KB
Template (20 off)	4KB	250 templates = 50KB
Graph	5KB	100 graphs = 500KB
Total		6,645KB (12% of memory)

- Templates for all Norbar tools (Torque Wrenches & Pneutorques®) to enable the operator to easily perform calibrations on their tools to the relevant ISO standard using the in-built calibration program.
In addition templates exist for all torque tools covered in ISO 6789:2003 with other tools easily added.
- Pre programmed calibration routines to ISO6789:2003.
- Automatically guides the user through the calibration routine required for the Tool.
- 2 USB ports for data transfer. Can be used with Bar code scanner, Mouse, Keyboard, Printer, Hub, etc.
- 12 languages.
- 8 modes for torque tool measurement: 'Track', 'Click', 'Dial & Electronic', 'Stall', 'Screwdriver', 'Hydraulic', 'Graph' (for visual analysis of torque profiles) and 'Pulse' (with a unique pulse tool algorithm to accurately determine pulse tool torque output).
- All Peak and 1ST Peak modes can be configured for either Manual or Auto Reset.
- 13 Torque units. Plus custom units for measurement of load, pressure, etc.
- Time & date stamp with results.
- Displays torque only, torque & angle, torque & speed, torque & power, torque & turns and torque & rate.
- TDMS (Torque Data Management System) software included for complete data management and archiving to a PC. Includes seamless data synchronisation. See TDMS handbook part number 34342 for more information.

QUICK START

Follow flowchart to use the T-Box. To just measure torque follow the **RED** bold path.
For more comprehensive details refer to BEFORE USE, MEASURE, SETUP and SPECIFICATION sections.



NOTE: If Target, Tool Templates, Tools or Non-Smart Transducers do not exist, add via Setup.

BEFORE USE

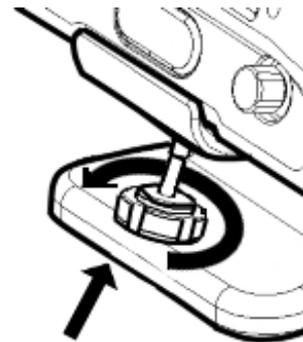
PREPARATION:-

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

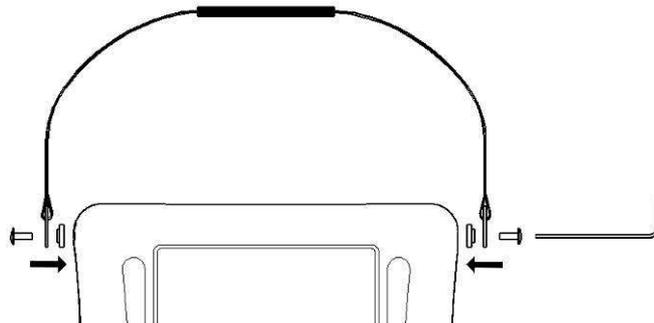
WARNING! ALLOW THE T-BOX TO EQUALISE TO THE AMBIENT TEMPERATURE/HUMIDITY BEFORE SWITCHING ON. WIPE OFF ANY MOISTURE BEFORE USE.

1. For bench use:
Fix stand to bench, use M10 bolts provided. **Do not tighten above 10 N.m.**
Mount T-Box on stand, tighten fixing screw by hand.

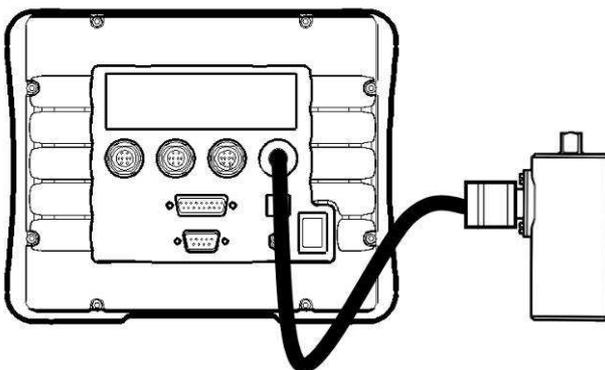
TIP: The T-Box will mount on a standard tri-pod (not supplied).



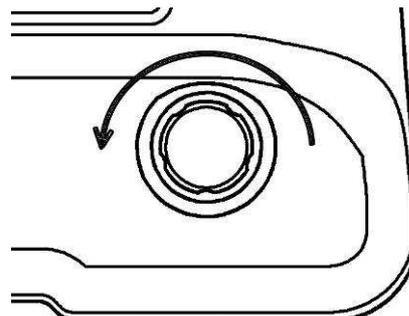
2. For portable use:
Connect neck strap to right & left of T-Box.
Fix with hex key provided.



3. Connect up to 4 transducers to transducer connectors TD1, TD2, TD3 & TD4.



4. Select transducer from front (TD1 is fully anti-clockwise).



5. If using with a control or shut-off system; connect to ANCILLARIES connector.
6. If using RS232 to output results; connect to Serial Output.
7. Connect back panel USB to PC (cable included) for use with TDMS software.

The TDMS software is included on the USB flash drive.

To load the TDMS software onto a PC:

1. Insert USB flash drive into PC.
2. Open TDMS handbook (Part No 34342) & follow instructions.

The TDMS software features the following:

- USB connection to Norbar T-Box instrument for fast data transfer.
 - RS232 connection to other Norbar instruments such as TTT series 3.
 - Data Base for archiving of data for calibration (and Use) of Torque Tools.
 - Statistical Process Control (SPC) on Test results for USE of Tools.
 - Set up individual (or multiple) T-Box's with Tools, Tool Templates, Targets and Non-Smart Transducers via the synchronisation options.
 - Multilingual Calibration Certificate (English / French / German / Spanish / Italian/ Russian).
 - Calibration certificate templates to ISO6789:2003.
 - Calibration certificate templates for Pneutorques® etc.
 - Ability to add a Setting (i.e. p.s.i.) and setting values against Torque calibration results on a Calibration Certificate.
 - Air pressure graphs can also be saved, viewed and printed.
 - Compatible with Windows® 2000, XP & Vista.
8. The T-Box can be powered from mains or battery. It is essential to charge the internal battery for 200 minutes (3 hours & 20 minutes) for full charge. To charge the internal battery, connect the Power supply adapter between the T-Box (9 V d.c. input) and a live a.c. supply.

TIP: Insert 9 V d.c. connector into T-Box before applying a.c. mains to ensure correct charging.

TIP. If the power cord has no plug fitted, wire as follows:

BROWN-LIVE

BLUE-NEUTRAL

GREEN / YELLOW-EARTH

If in doubt consult a qualified electrician.

TIPS: The T-Box can be used whilst the battery is charging.

Recharging is independent of the on/off switch. The battery can be charged continuously.

9. Connect USB flash drive to T-Box front socket to transfer data.

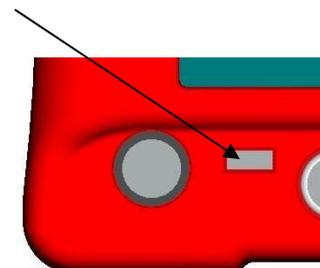
The USB flash drive contains:

T-Box Handbook (Part # 34335)

TDMS software (Part # 37748)

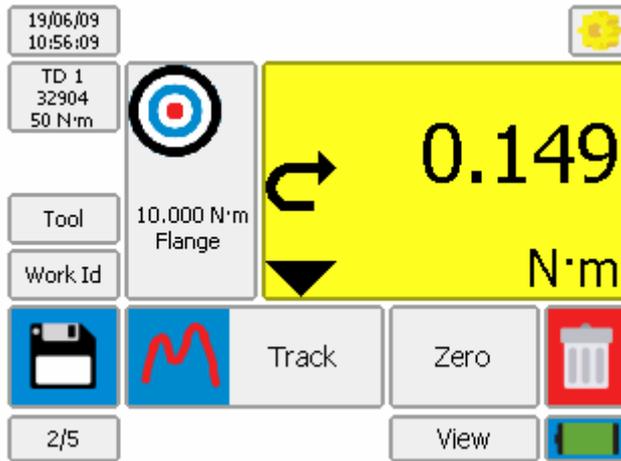
TDMS Handbook (Part # 34342)

To access the handbooks & TDMS software, plug USB flash drive into your PC. Copy the handbook to your PC and open to view.



SETUP FOR USE:- _____

Turn T-Box on. The Norbar logo appears. Wait for the green progress bar at the bottom of the logo screen. The measure screen will then be shown:



Screen area	Action	Further information
	Date & Time. Press to view Logo screen.	Software Version # & T-Box Serial # will also be shown. Press screen to return to Measure.
	Battery / Mains condition.	Press to show current power state. Press screen to return to Measure.
	Choose options for Transducer, Tool, Work Id, Target & Mode.	See MEASURE.
	Measure & save / delete results.	See MEASURE.
	SETUP: Targets, Tool Templates, My Tools, Transducers, USB, Language, Modes, Units, etc.	See SETUP.

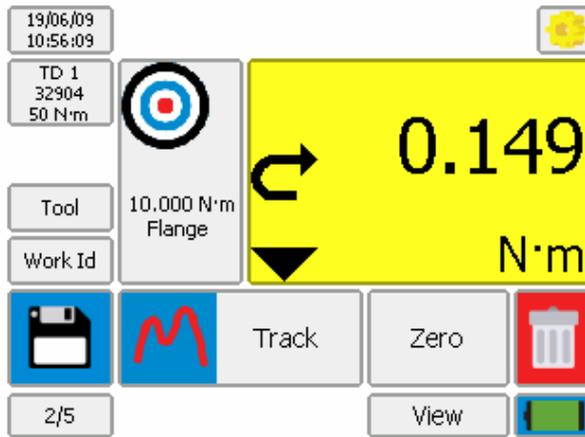
For more information see SPECIFICATION pages.

MEASURE

PREPARATION:-

1. Turn T-Box on.

The measure screen will be shown:



2. Before taking measurements ensure the T-Box is prepared correctly

The following icons are used to navigate:

Meaning	Scroll	Exit (no change)	Exit
Icon			

Transducer:-

Press to show / select transducer details:

For SMART transducer details are shown.

For non-SMART Transducer shows "TD1 Connect transducer". Press to select transducer. Add new transducer in SETUP.

1. Transducer

Serial# 123456
Model# 123456
Units N·m
Capacity 100
Angle No
Calibrated 18/5/2009 08:20:39
 mV/V
Not Linearised 2

3. Transducer ?

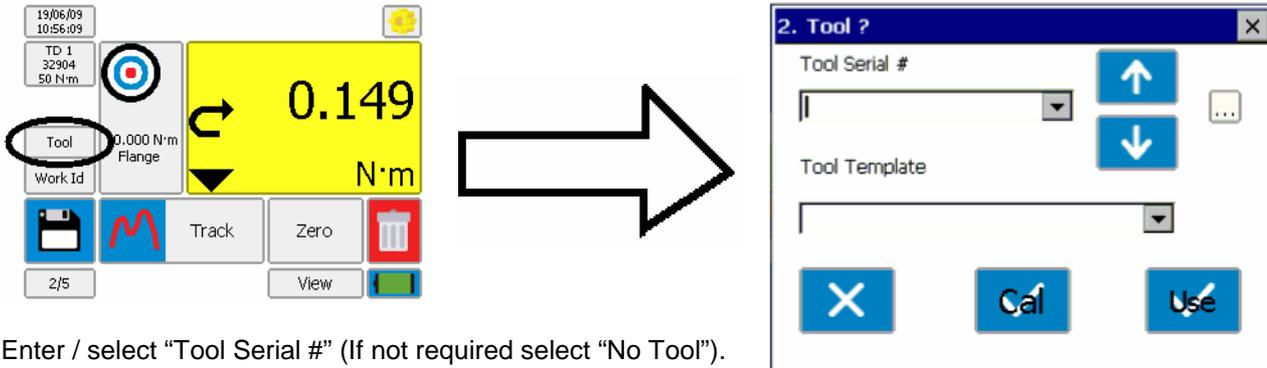
Serial #	Model #	Capacity
TEST FIX	60242	100 N·m
1EST FIX	60242	100 N·m
2EST FIX	60242	100 N·m

More information see SPECIFICATION – TRANSDUCER INTERFACE.

Tool :- _____

Press 'Tool' to select the tool to be calibrated or used.

A Tool can be a Torque wrench, Pneutorque, Electric tool, Torque screwdriver, etc.



Enter / select "Tool Serial #" (If not required select "No Tool").

TIP. If tools are bar coded, a USB bar code scanner (not supplied) can be used to enter the number.

TIP. To help find a tool serial #, connect a USB keyboard (not supplied). Enter the first characters to display all tool serial # with that prefix.

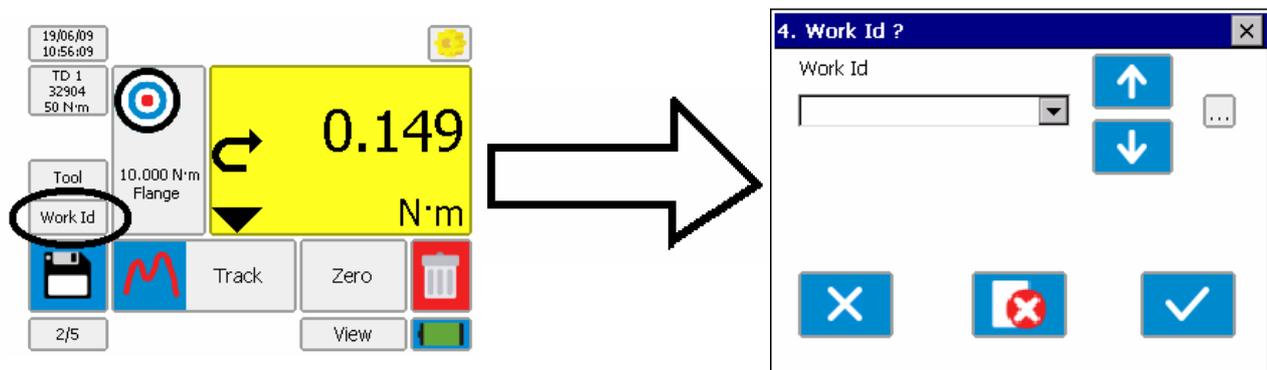
Select "Tool Template", this specifies full details of the tool for calibration purposes.

Tick option	Reason	Comment
	Calibrate a tool.	Pre programmed calibration sequence for Torque Wrenches and Pheutorques.
	Use a tool. (take torque results from a task, application or job).	Selecting a tool serial # is important for data management. If tool serial # is not selected, the results will be saved as "No Tool".

NOTE: To remove the tool PRESS & HOLD the tool area until "Tool" is shown.

Work Id.:- _____

'Work Id.' (Work identification) is a reference to the task, application, job or operator.

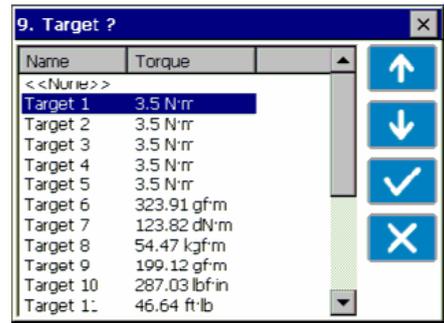
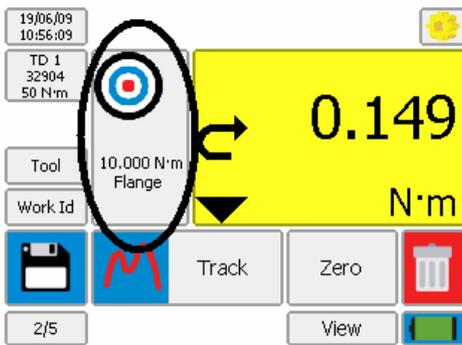


	Example of Work Id.
Cal	Operator name.
Use	Could include a bolted flange, engine cylinder head, vehicle wheel nuts, etc.

NOTE: To remove the Work Id PRESS & HOLD the Work Id area until "Work Id" is shown.

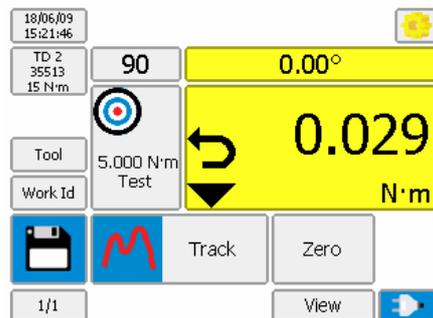
Target:-

NOTE: Not required for  as target is set in the Tool Template.



Select target (if required).

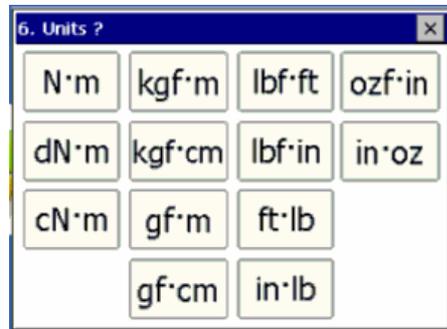
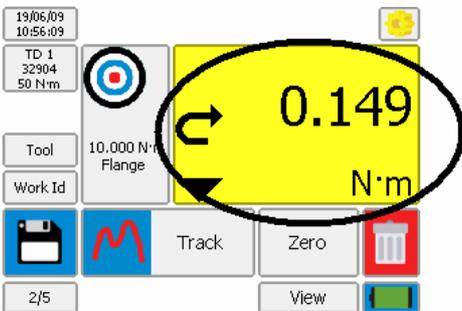
If an angle transducer is used, an angle target can also be shown:



NOTE: To remove the target PRESS & HOLD the target area until "Select Target" is shown.

Units:-

NOTE: The units available for  are set in the Tool Template.



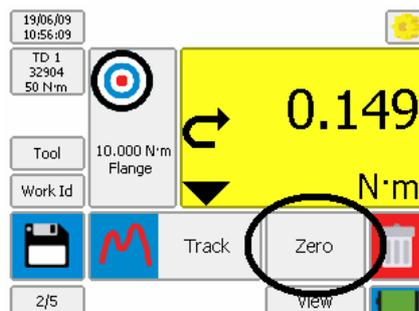
Press to select required units.

Zero display:-

Ensure in TRACK mode.

Exercise the transducer in required direction of use.

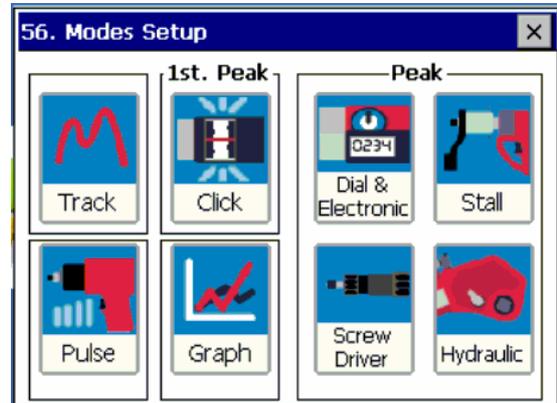
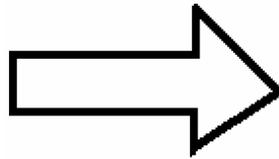
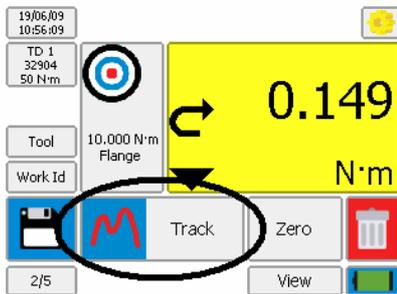
Press 'Zero' to zero display.



TIP. If the displayed reading does not zero the transducer may be overstrained. Return defective transducer to Norbar.

Mode:- _____

NOTE: The modes available for  are set in the Tool Template.



Select mode for the Tool being used.
 The currently selected mode is shown with a BLUE boarder.

Take Results:- _____

Operate tool and measure torque on T-Box.

 Calibrate	
20%	The measurement point is displayed on the left of the display for an ISO6789 Tool Template (eg: 20%, 60% & 100%). This is a % of the maximum torque value of the torque tool (or at the nominal / set value for tools of Type II, Classes B and E).
 20.0 N·m Calibrate 1	The Target area shows the first (and subsequent) measurement targets in torque units. Set the tool to the required value.
1/5	The results counter (bottom left) shows the number of measurements at that target. E.g. 1/5 is result 1 of 5.
	Take results (for this example it will be 5 results at 20% of full scale). For full details of the mode operation see SPECIFICATION – MODES. After each result the results counter will increase by 1 (to show 2/5....3/5....4/5....5/5). When 5 results are taken, the % area changes to the next measurement value; in this example it will be 60%. The Target area will confirm the torque value required. Again take the results (5 in this example). The % area changes to the next measurement value, in this example 100%. The Target area will confirm the torque value required. Again take the results (5 in this example). (To exit calibrate mode before complete, PRESS & HOLD the TOOL button until “Tool” is shown).
	The display will show COMPLETE. The % area on the display will disappear. The Tool will be de-selected automatically. Press VIEW to see calibration results.

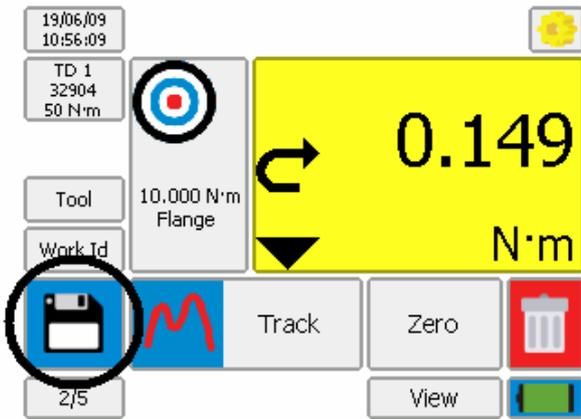
TIP. COMPLETE will flash up in red if any tests (that are outside of the pass limits) are done on a Tool prior to (or post to) the save button being pressed.



Use

<p>Individual results</p>	<p>For details of the mode operation see SPECIFICATION – MODES.</p>
<p>Continuous results (Data Logging)</p>	<p><u>To enable Data Logging, configure the Serial Port Setup as follows:</u></p> <p>On screen 74 - Tick “Continuous Output” On screen 93 – “Minimum angle change for output” = 1 (for example). In this example Torque & Angle values are logged for every 1 degree change in the angle. On screen 93 – Tick “Log All Serial Output” Select the Tool (if required), select USE. Enter the Work Id (if required).</p> <p>Note: To remember the Work Id, enable a Target (The number of readings within the target must be more than the number of readings you are expecting to receive).</p> <p><u>To use Data Logging:</u></p> <p>Use TRACK mode for data logging control (other modes will log continuously, with no control).</p> <p>Data is automatically logged at 5 readings per second (factory default). The save button has no effect.</p> <p>For Torque transducer: Data logging starts when the torque passes above 1.8% of transducer capacity. Data logging stops when the torque passes below 1.8% of transducer capacity.</p> <p>For Torque and Angle transducer: If “Minimum Angle change for output = 0” – Data is logged whilst in the measurement screen. If “Minimum Angle change for output = 5” (for example) – In this example Torque & Angle values are logged for every 5 degree change in the angle.</p> <p>Note: To view large amounts of data will take many seconds (Only the last 20,000 logged results can be viewed).</p> <p>To avoid this delay, transfer logging data directly from the T-Box to the USB stick by pressing the following setup button:</p> <div data-bbox="327 1541 464 1727" data-label="Image"> </div>

Save Results:- _____



When is a measurement saved?

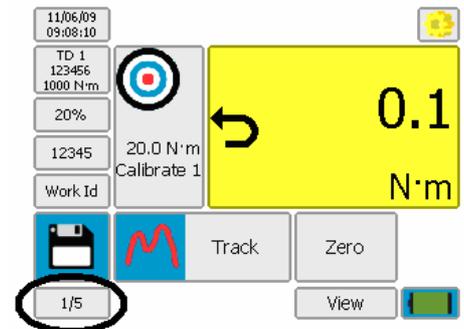
Reset type	Save Button action	Description:	Result Saved?	Result displayed at top of screen?
Manual reset	Press to save.	SAVE	√	√
Auto reset	LIGHT BLUE	Wrench set up	X	√
	DARK BLUE	SAVE	√	√

NOTE: The maximum number of save requests in track mode is 1 per second.

The ZERO button becomes RESET in memory modes. Press RESET to reset the memorised reading, without the result being saved.

Every SAVE will add 1 to the Number of Tests counter.

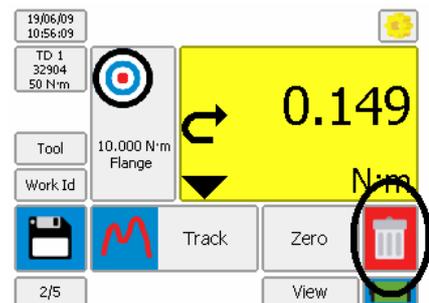
Use	Number of Tests Counter Example	Explanation
Use without Target	1	Number of Tests counter. Press counter to reset.
Use with Target	1/100	Test 1 of 100 (with “# of Tests” set to 100) in Target Setup.
CALIBRATION	1/5	The measurement number for the measurement point, e.g. 1/5 for measurement ‘1’ of ‘5’.



When a result has been saved the ‘BIN’ symbol appears:

Press ‘BIN’ to

1. Delete the last test result from any saved data.
2. The last measurement will be removed from the top of the screen
3. The Number of Tests counter will decrease by 1.
3. The BIN symbol will disappear.

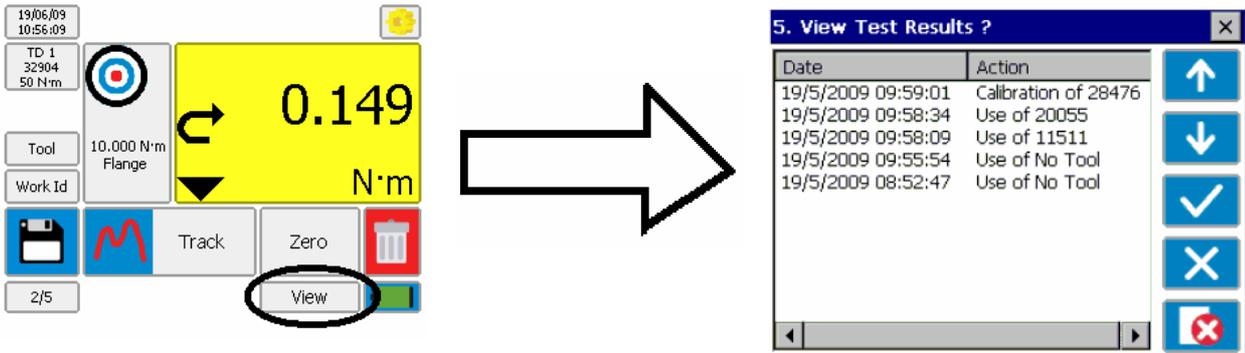


At the end of CALIBRATION or when ‘# of Tests’ complete; T-Box displays:

COMPLETE

View / Delete Results:-

To view results for use, calibrations & graphs:



Select result then press:

- TICK to view [Shows: Tool, Mode, Transducer and results (with LO/OK/HI if target was used)].
- RED CROSS to delete (via the password if set).

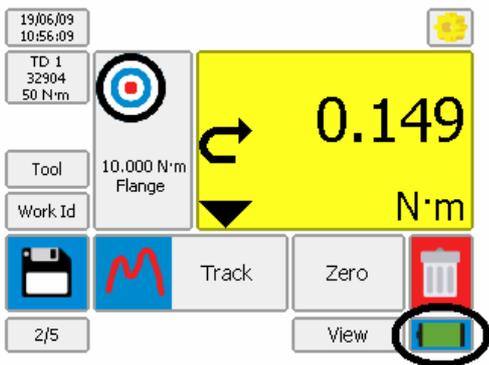
The results are listed in DATE order, with the latest at the top. The action is defined as:

Type of results	Tool selected (Tool Serial # shown, e.g. 20055)	Tool not selected
Use	Use of 20055	Use of No Tool
Cal	Calibration of 20055	Calibration of No Tool
Graph	Graph of 20055	Graph of No Tool

If a Work Id has been specified, it will appear in brackets.

E.g. If the Work Id is "FLANGE 6" the display will show "Use of 20055 (FLANGE 6)".

Mains / Battery:-



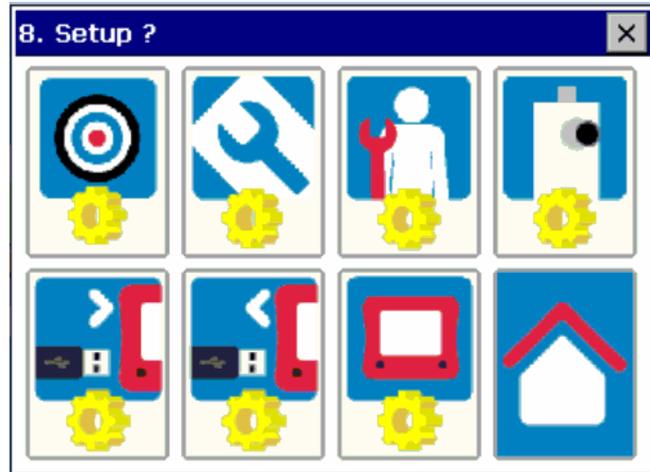
Mains or Battery	Icon	Power state
Mains.		Charging. Full charge in 200 minutes.
		Charged.
Battery.		Full.
		Low.
		Flat.

SETUP

T-Box SETUP covers: Targets, Tool Templates, My Tools, Non-Smart Transducers, USB, Language, Modes, Sleep, Password, Time & Date, Angle Display, Units and Serial Port.

The TDMS software can also set up the Targets, Tool Templates & Transducers.

Press:  in measure to show:



Throughout SETUP and Selection, the following functions are used:

Icon	Meaning
	Scroll
	Add
	Edit
	Delete (may be password protected)
	Exit (no change)
	Exit

TARGET:- _____



Select Target to Add, Edit or Delete.

Target options	Comment
Name	Target name.
Description	Target description.
Target	Target torque value.
Units	Select units or press  to enter custom units. (Custom Units allow load cells and other non-torque transducers to be used).
Upper Limit %	The % of the Target value allowed above the Target value.
Lower Limit %	The % of the Target value allowed below the Target value.
Direction (↺, ↻, ↻ & ↻)	Direction Torque Target operates.
# of tests	The number of tests / measurements saved at this target.
Tool Stop	Torque value at which the STOP output on Ancillaries connector changes to logic 1.
Internal Snug Torque Trigger	NO-TICK = Snug torque triggered from Ancillaries. TICK = Snug torque triggered when Torque value reaches 'Snug torque' value in T-Box.
Snug Torque	Torque value to start measuring angle.
Direction (↺, ↻, ↻ & ↻)	Direction Angle Target operates.
Angle Limits?	UN-TICK = No angle limits. TICK = Use angle limits.
Target Angle	Target angle value in degrees.
Upper Limit	The number of degrees allowed above the target.
Lower Limit	The number of degrees allowed below the target.
Next Target	Ability to link to the next target. Required for sequence tightening to different targets.

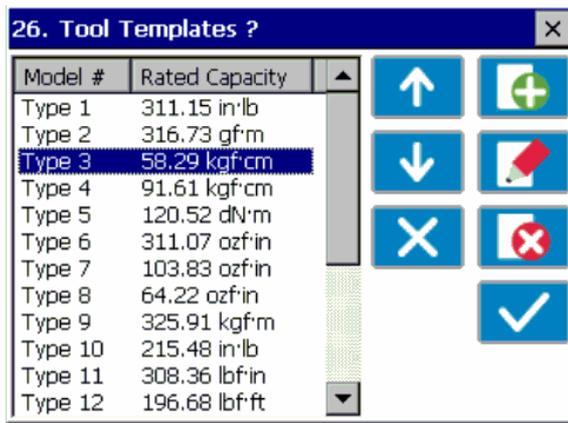
Targets can also be setup in the TDMS software.

TOOL TEMPLATES:-

Press



to show:



Templates exist for all Norbar tools (Torque Wrenches & Pneutorques®) in multiple torque units.

Select Tool Template to Add, Edit or Delete.

Tool Template options	Comment
Model #	Model number of Tool.
Description	Description of Tool.
Tool Type	ISO 6789 Type I / II & Class A / B / C / D / E or Other.
Rated Capacity	Tool rated capacity.
Units	Units of Tool rated capacity.
Calibrate Across Range	UN-TICK = Calibrate at single point of measurement. TICK = Calibrated at up to 5 points of measurement (e.g. 20%, 60%, 100%).
# of Tests	Number of Tests at each point of measurement.
Upper Limit %	The % allowed above the point of measurement (Target).
Lower Limit %	The % allowed below the point of measurement (Target).
Set Points	The % values used for the different points of measurement (Targets). These can be entered if Tool Type = Other.
Dial / Screwdriver / Hydraulic / Click / Stall / Pulse / Graph / All	Select mode(s) available for Tool Template. This will stop the operator selecting the wrong mode.

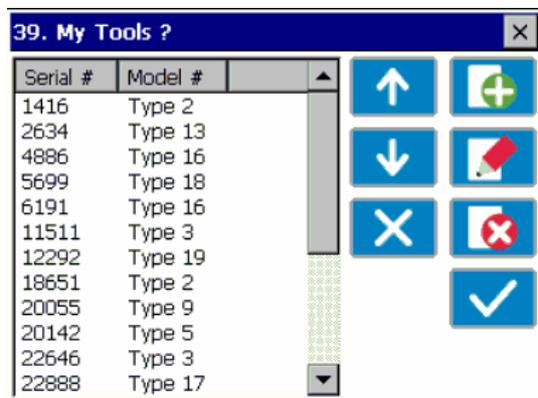
For more information on ISO 6789 see "SPECIFICATION - HAND TORQUE TOOL CLASSIFICATION". Tool Templates can also be setup in the TDMS software.

MY TOOLS:-

Press



to show:



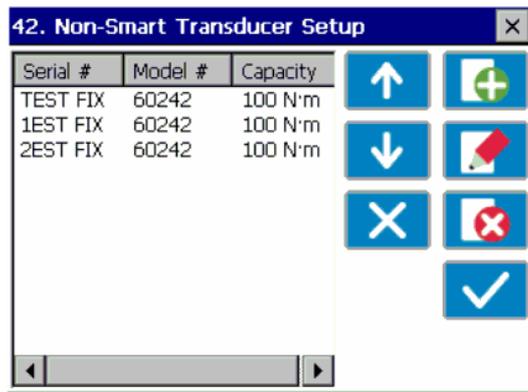
Select Tool to Add, Edit or Delete.

My Tools options	Comment
Serial #	Serial number of tool.
Model #	Select from models with a Tool Template.

NON-SMART TRANSDUCERS SETUP:-

NOTE: This feature is not required for Norbar SMART transducers (with suffix: .LOG, .LOGA, .IND & .INDA).

Press  to show:



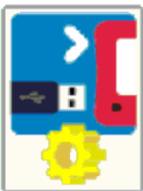
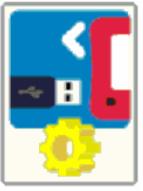
Add / edit / delete as required.

Transducer options	Comment
Serial #	Serial number of Transducer.
Model #	Model number of Transducer.
Capacity	Capacity of Transducer.
Units	Select units or  for custom units. (Custom Units allow load cells and other non-torque transducers to be used).
↻ mV/V	Clockwise mV/V from Transducer calibration certificate.
↺ mV/V	Anti-Clockwise mV/V from Transducer calibration certificate.
Supports Angle Measurement	UN-TICK = NO angle measurement. TICK = Angle displayed.
Pulses per revolution	Number of pulses per revolution produced by the angle Transducer.

Non-Smart Transducers can also be setup in the TDMS software.

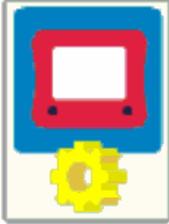
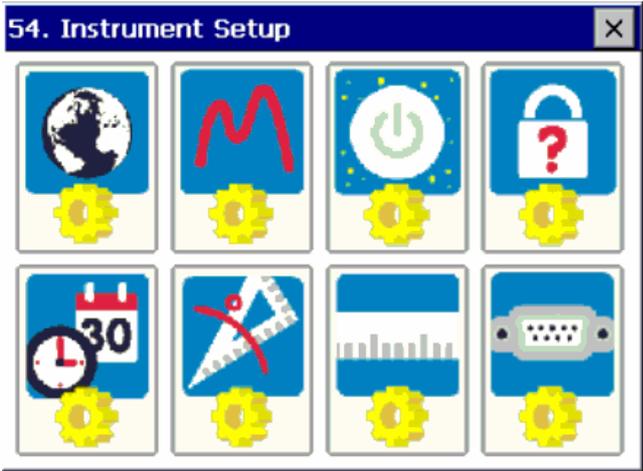
USB in / out:-

Insert USB flash drive into front of T-Box.

Action	Press	Message if not successful	Message if successful
Send data from USB flash drive to T-Box.		"No USB drive":	Wait approximately 30 seconds. "All files transferred".
Send data from T-Box to USB flash drive.			

For more information see "SPECIFICATION - USB".

Instrument setup:-

Press  to show: 

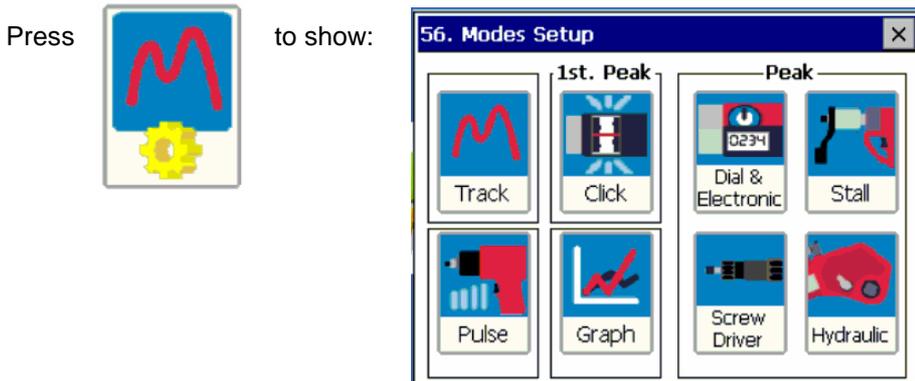
Language:-

Press  to show: 

Languages are:
English / French / German / Italian
Danish / Spanish / Dutch / Finnish
Swedish / Norwegian / Portuguese / Russian

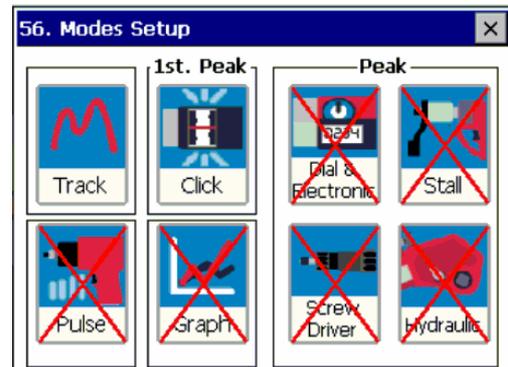
Select language.

Modes setup:-



QUICKLY PRESS icon to enable / disable (RED X) the mode:

Disable all modes that are NOT required.
(Track mode cannot be disabled).



PRESS AND HOLD icon to setup mode:

Mode options (where applicable)	Comment
Filter Frequency	TICK required filter frequency. UN-TICK all and press  to enter "other" frequency.
First Peak Sensitivity	Select LOW (10% of reading) / MEDIUM (5% of reading) / HIGH (2.5% of reading).
Auto Reset	TICK = Auto Reset (1 st Peak mode – Hold time starts at 1 st peak. Peak modes – Hold time starts when the value goes below 0.5% of full scale at zero). UN-TICK = Manual Reset.
Auto Reset Hold time	Hold time in seconds (1 to 10).
Active From	Set from 0 to 50% of transducer capacity. Below Active From mode will 'Track'. Above Active From mode will operate. Used to overcome false results caused by some tools / operators at low torques.
Sample Rate	Set sample rate. Only applicable to Graph mode. Set for Multi event:  (0.2Hz to 306Hz) Set for Single event:  (2.5Hz to 306Hz) 0.2 Hz is 1 sample every 5 seconds. 306Hz is 306 samples per second.

88. Sample Rate ? X

0.2Hz 300Hz

 49 Hz

 242 Hz

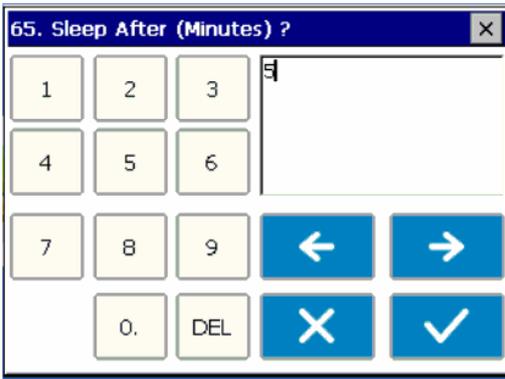
 

TIP. In CLICK mode only a genuine first peak will be output or saved.

TIP. In CLICK mode a sensitive torque wrench may give inconsistent results, to compensate:
1. Reduce FIRST PEAK SENSITIVITY to MEDIUM or LOW.
2. Increase ACTIVE FROM Threshold.

Sleep After:-

Press  to show:



Enter time in minutes.

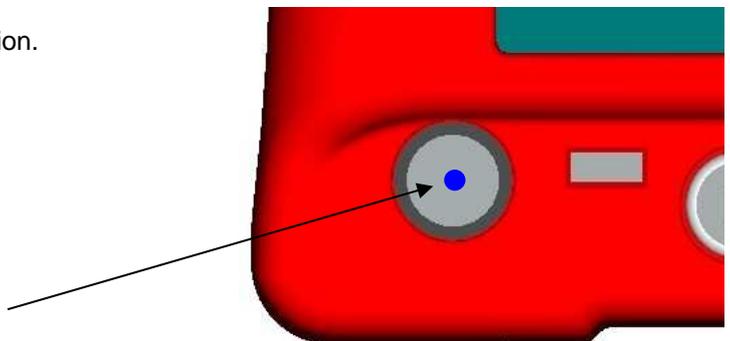
The T-Box will go to sleep if there has been no activity for the time set in 'Sleep After'.

During sleep, none of the T-Box functions operate.
If continual operation is essential disable the sleep function.
To disable leave 'Sleep After' value as blank.

The Sleep function is only active on battery power.

The Sleep function will increase battery life when the T-Box is not in use.

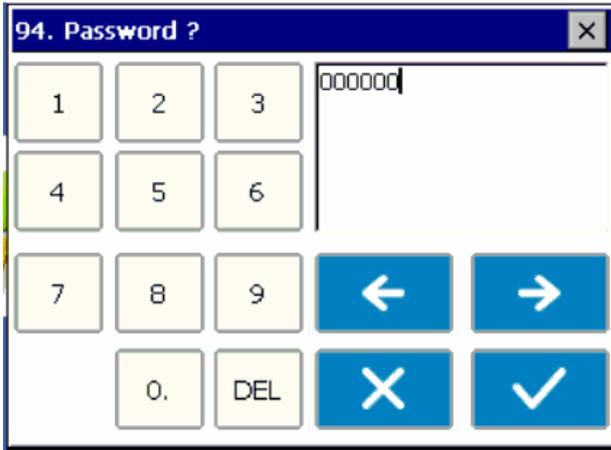
When the T-Box is sleeping, the front button will light.
The touch screen is inactive.
Press the front button to wake up T-Box.



TIP. Check the zero setting of the transducer on return from sleep after a warm up period.

Password:-

Press  to show:



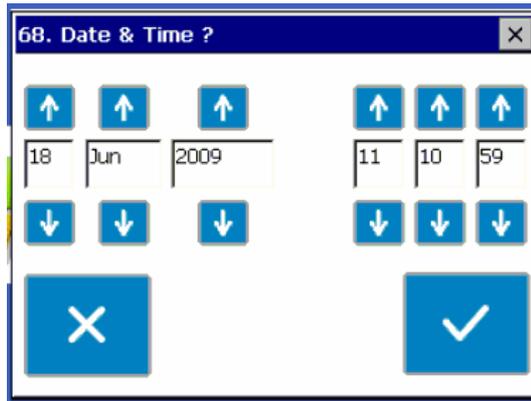
The Password is inactive whilst set to '000000'.

Options	Password type	Comment
Press	Password	Default password = 000000 (six zero's)
Press & Hold	Advanced Password	No operator functions

TIP: If password is lost, contact Norbar.

Date & Time:-

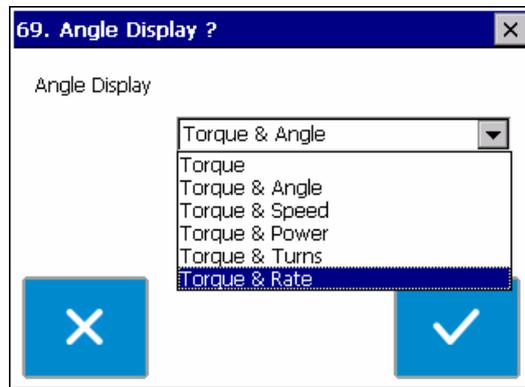
Press  to show:



Select Date & Time.

Angle Display:-

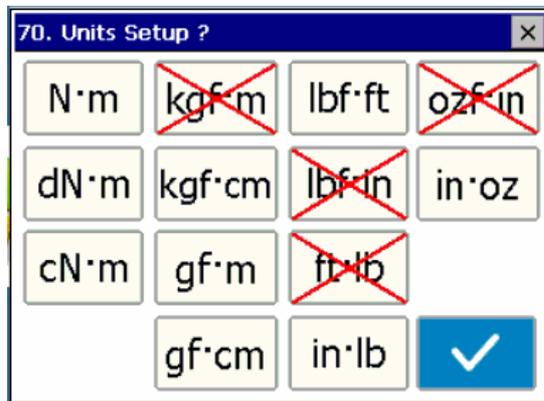
Press  to show:



Angle Display (Options for angle transducer)	Display	
	Metric torque units	Imperial torque units.
Torque	Torque only.	
Torque & Angle	Torque & angle in ° (degrees).	
Torque & Speed	Torque & Speed in RPM (Revolutions per minute).	
Torque & Power	Torque & Power in W (Watts)	Torque & Power in hp (horse power)
Torque & Turns	Torque & Rev (Revolutions)	
Torque & Rate	Torque & Rate per degree	

Units:-

Press  to show:



Press to enable / disable (RED X):

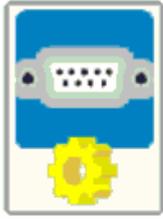
Disable all units NOT required.

These are only applicable if a Tool has NOT been selected.

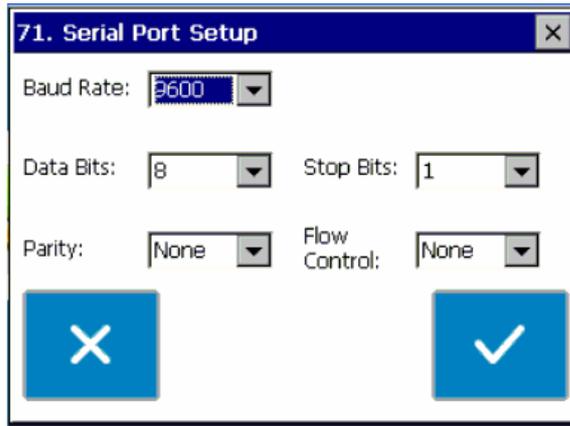
Press TICK when all selections have been made.

Serial Port:-

Press



to show:



Set serial port to match receiver.

Serial Port options	Comment	Default setting
Baud Rate	1200 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 / 230400	9600
Data Bits	7 / 8	8
Parity	Mark / Space / Odd / Even / None	None
Stop Bits	1 / 1.5 / 2	1
Flow Control	Hardware (CTS) / Software (X-ON/OFF) / None	None
First Character	- / +/- / None	-
Line Delay	Added delay to slow data output.	0.5 seconds
Output Limits	TICK = Torque limits status (LO / OK / HI) sent before data. UN-TICK = No limits status.	TICK
Output Units	TICK = Units sent after data. UN-TICK = No units.	TICK
Output Date & Time	TICK = Date & Time sent after data. UN-TICK = No Date & Time.	UN-TICK
Output Line Feed	TICK = Line Feed sent after data. UN-TICK = No Line Feed.	UN-TICK
Continuous Output	TICK = Serial output always sending (Maximum 5 readings per second). Use 'Line Delay' to regulate continuous output (use 0 for maximum output speed). UN-TICK = Serial output sent when requested.	UN-TICK
Separator	Comma / Space / Tab	Space
Always Output Tool Serial #	TICK = Tool Serial # output before data. UN-TICK = Tool Serial # not output.	UN-TICK
Output Tool Serial # when changed	TICK = When changed output Tool Serial # before data. UN-TICK = Tool Serial # not output.	UN-TICK
Always output Work ID	TICK = Work ID output before data. UN-TICK = Work ID not output.	UN-TICK
Output Work ID when changed	TICK = When changed output Work ID before data UN-TICK = Work ID not output.	UN-TICK
Minimum Angle change for output	Data is output for a set change in angle. (Use with angle transducer. Use in TRACK mode. Set "Continuous Output" = TICK. Set "Line Delay" = 0. To turn off set option to 0 (zero)).	0
Log All Serial Output	Save the Data that is output inside the T-Box	UN-TICK

TIP: Using the 'Comma' as the Separator will create results with 'comma separated values' (csv), as often required by Microsoft® Excel.

For more details see **SPECIFICATION - SERIAL PORT.**

SPECIFICATION - GENERAL

Input voltage	Equivalent torque	Accuracy	Calibration uncertainty*
@0.5 mV	5% of capacity	±0.1% of reading	±0.13%
@1.0 mV	10% of capacity	±0.05% of reading	±0.08%
@2.0 to 18.9 mV	20% to 120% of capacity	±0.05% of reading	±0.06%

*Using a coverage factor of k=2, to give a confidence level of approximately 95%.

Resolution	5 active digits for all Norbar transducers.
Display	5.7" QVGA TFT colour display with touch screen. With update rate of three times per second (3Hz).
Torque unit conversions	To 'BS 350:2004 Conversion factors for units'.
Zero suppression	TRACK None. ALL OTHER MODES suppressed from 0 to 0.5% of transducer calibration range.
Date / Time	Date format DD/MM/YY. Time format HH:MM:SS (24 Hour clock).
Time/date compliance	To year 2062.
Units of measurement	See MEASURE / Select Units (Custom Units also available).
Frequency response	8 th Order Butterworth low pass filter with a -3dB point settable from 100 to 2500 Hz.
Angle display	Channel A & B quadrature inputs give 4 unique logic states per pulse. Angle display shown to 2 decimal places as examples:

Transducer pulses per revolution	Transducer pulses per degree	Quadrature logic states per degree	T-Box resolution
360	1	0.25	0.25
720	2	0.125	0.13
1440	4	0.0625	0.06

Maximum Angle 21,000,000 degrees.

Operating temperature range	+5°C to +40°C.
Storage temperature range	-20°C to +70°C.
Maximum operating humidity	85% Relative Humidity @30°C.
Power supply adapter	100 to 240 V a.c. at 50-60 Hz input. 9V, 1.66A d.c. output (centre positive).
Charge time	3 hours and 20 minutes.
Discharge time	5 hours continuous or over 8 hours with sleep mode used 50%.
Power consumption	15 W - maximum.
Power cable	2 metres (6 ft 6 ins) long minimum.
Power plug fuse (if fitted)	1 Amp.
Battery pack	2500 mAh, 6.0 volt (5 cell) NiMH (Nickel metal Hydride).
Coin cell	Renata 190 mAh (CR2032FH).
Weight (T-Box only)	1.5 Kg (3.3 lb).
Dimensions	162 mm high x 205 mm wide x 60 mm deep.
Case materials / finish	Rigid polyurethane with fine texture acrylic paint finish.
Environment	Indoor use within a light industrial environment.
Electromagnetic Compatibility (EMC) Directive	In conformance with EN 61326:2006.
Low voltage directive	In conformance with EN 61010-1:2001. To environmental conditions Pollution Degree 2 & Installation Category (Over voltage Category) II.

Due to continuous improvement all specifications are subject to change without prior notice.

SPECIFICATION – TRANSDUCER INTERFACE

The 4 transducer connectors are designed for use with most four wire bridge strain gauge type transducers. All 4 transducer inputs can measure Norbar torque & angle transducers.

SMART TRANSDUCERS:- _____

Norbar 'SMART' transducers store the calibration data; they are available in 4 types:

Suffix	'SMART' Transducer Description		
	Integral Angle Encoder?	Calibration	mV/V figure supplied
XXXXX.IND	No	mV/V.	Yes
XXXXX.INDA	Yes	mV/V	Yes
XXXXX.LOG	No	With a T-Box in units of calibration	Yes
XXXXX.LOGA	Yes	With a T-Box in units of calibration	Yes

For additional accuracy SMART transducers can be factory programmed with a second degree polynomial, so any slight errors can be reduced. These transducers are identified as 'linearised' on the transducer information screen.

NON-SMART TRANSDUCERS:- _____

The T-Box is designed to measure other transducers with the following specification:

Parameter	Minimum	Maximum
Bridge Resistance (Ω).	350 Ω	1000 Ω
Millivolt / volt value (mV/V).	0.50 mV/V.	3.15 mV/V.
Zero balance.	+/- 3% of transducer capacity (3 mV/V).	+/- 9% of transducer capacity (1 mV/V).
Transducer capacity ranges.	0.010000	1,500,000
Displayable overrange.	120% of transducer capacity.	

For 'NON-SMART' transducers the transducer parameters can be stored in the T-Box for ease of use.

NOTE: If any of the transducer's parameters are changed, like a re-calibration of the mV/V value, the transducer's stored parameters must be updated prior to use.

NOTE: ETS Transducers supplied with an amplifier module will need to be modified for use with the T-Box.

PIN CONNECTIONS:- _____

Pin No	Function
1	+ve transducer excitation.
2	-ve transducer excitation.
3	+ve transducer signal.
4	-ve transducer signal.
5	Digital 0 volts.
6	Digital +5 volts for transducer selected, digital 0 volts when not selected.
7	Rotary transducer angle input (Channel A).
8	Rotary transducer angle input (Channel B).
9	Serial clock (SMART memory).
10	Serial data (SMART memory).

CONNECTOR TYPE:- _____

Lemo® 10 way panel socket, size 2B.

The mating part to this connector is a Lemo 10 way, size 2B free plug (Lemo part number FGG.2B.310.CLAD722).

SPECIFICATION - ANCILLARIES

The Ancillaries connector contains inputs and outputs for connection to external equipment.

PIN CONNECTIONS:- _____

Pin No	Function
1	Digital +5 V (maximum current 5 mA).
2	External PRINT / RESET Input (Active High).
3	Low Limit Torque Output.
4	Pass Limit Torque Output.
5	High Limit Torque Output.
6	Low Limit Angle Output.
7	Pass Limit Angle Output.
8	High Limit Angle Output.
9	Digital 0 V.
10	Tool Stop Output.
11	Analogue Output.
12	Analogue Output 2.5 V.
13	Analogue Output 0 V reference (Do not connect to a noisy electrical ground).
14	External Snug Trigger Input.
15	Not Used.

EXTERNAL PRINT / RESET INPUT:- _____

Pins 1 & 2 are intended for use as an EXTERNAL PRINT / RESET:-



The switch must remain active for at least 200 mS. Screened cable is recommended.

LIMIT OUTPUTS:- _____

Pins 3, 4, 5, 6, 7 & 8 are buffered logic outputs intended for Go/No Go control of external equipment. The limit outputs are referenced to Pin 9 (Digital 0 V). All limit outputs are active HIGH & change at 208 times per second.

The limit outputs change exactly with increasing torque, and at 0.5% of transducer capacity below the limit with decreasing torque. This eliminates the logic lines oscillating.

The Limit output current is, High = -0.8 mA, Low = 16 mA (not for direct control of relays).

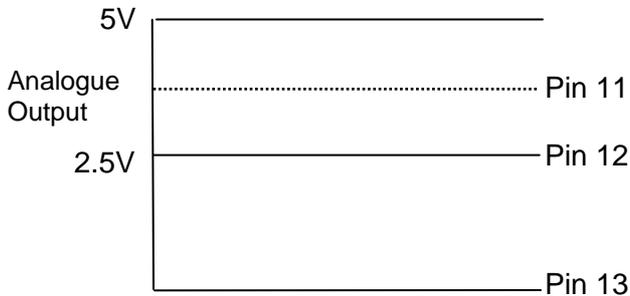
For more information see 'SPECIFICATION - LIMITS'.

TOOL STOP OUTPUT:- _____

Tool Stop is used to provide a stop signal for an external pneumatic, hydraulic or electric tool. When the measured torque goes above the Tool Stop value (set in the Target Setup) this pin goes HIGH (5 V) with reference to pin 9.

ANALOGUE OUTPUT:- _____

The analogue output is designed for connection to a control system. It is a true analogue value, so has a very fast frequency response of above 10 kHz. The calibration of the analogue output is factory set and not adjustable, it is not affected by the instrument calibration.



The analogue output is PIN 11.

If the output is measured against PIN 12 (2.5 V) the signal will swing positive for clockwise torque and negative for anticlockwise torque.

If the output is measured against PIN 13 (0 V) the signal will always be positive, with zero torque around 2.5 V.

TIP. Some transducers (Norbar Annular type) will give a negative output change for a positive torque. This is because they are designed to measure reaction torque.

The output voltage is a function of the mV/V value. The larger the mV/V value the larger the analogue output voltage. At transducer capacity the analogue output voltage (in volts) is numerically equal to the mV/V value divided by 2.

TIP. To find mV/V value press 'TD#' button in measure screen or see transducer's calibration certificate.

Using 2.5V (PIN12) as a reference:

Torque	Analogue output (PIN 11)		
	@ 1.0mV/V	@ 2.0 mV/V	@ 3.0 mV/V
- capacity of transducer	-0.5 V	-1.0 V	-1.5 V
Zero	0.0 V	0.0 V	0.0 V
+ capacity of transducer	+0.5 V	+1.0 V	+1.5 V

Using 0V (PIN13) as a reference:

Torque	Analogue output (PIN 11)		
	@ 1.0mV/V	@ 2.0 mV/V	@ 3.0 mV/V
- capacity of transducer	2.0 V	1.5 V	1.0 V
Zero	2.5 V	2.5 V	2.5 V
+ capacity of transducer	3.0 V	3.5 V	4.0 V

TIP. The analogue output will not operate in sleep mode. If using the analogue output continuously then disable the feature (in Instrument Setup) by leaving the 'Sleep After' setting blank.

The accuracy of the analogue output is +/- 2% of voltage reading. For a more accurate output value the voltage can be externally scaled against the displayed torque.

EXTERNAL SNUG TRIGGER INPUT:- _____

The external snug trigger is used to start the angle measurement; for external operation ensure the Target Setup has "Internal Snug Torque Trigger" UN-TICKED. Use logic 5V (HIGH) input with reference to pin 9 (0V).

CONNECTOR TYPE:- _____

15 way female 'D' type connector.

SPECIFICATION - SERIAL PORT

The serial port is for sending data to a PC or serial printer.

WHEN IS DATA SENT?:- _____

When the T-Box is measuring data is sent:

1. When the 'SAVE' key is pressed.
2. When the AUTO RESET timer operates (if the 'SAVE' key has a dark blue background).
3. When the "External Print / Reset Input" is used; see SPECIFICATION – ANCILLARIES.
4. When continuously logging.

WHAT DATA IS SENT?:- _____

The data can include: Date, Time, Tool, Work ID, first character, torque limits, measured value, units of measurement, angle and line feed. The separator appears between each item.

SERIAL PORT OPTIONS:- _____

See SETUP section.

PIN CONNECTIONS:- _____

The port is configured as DTE (Data Terminal Equipment) and conforms to RS-232-C specifications. The transmitted data voltage levels are between +5 to +9 volts and -5 to -9 volts.

Pin No	Function
1	Not Connected.
2	Received data (to T-Box).
3	Transmitted data (from T-Box).
4	Not Connected.
5	Signal ground 0 V.
6	Not Connected.
7	Not Connected.
8	CTS (clear to send).
9	Not Connected.

DATA OUTPUT EXAMPLE:- _____

Code: DP=Decimal Point. CR=Carriage Return. SP=Space.
T-Box with the serial port set to the factory defaults. Reading 1068.4 lbf.ft (clockwise).

1	0	6	8	DP	4	SP		b	f	DP	f	t	CR
---	---	---	---	----	---	----	--	---	---	----	---	---	----

NOTE: The maximum number of characters per line = 24.

CONNECTOR TYPE:- _____

9 way male 'D' type connector.

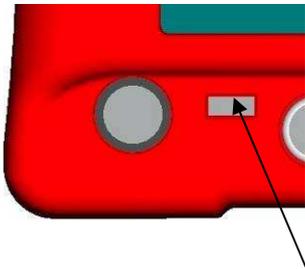
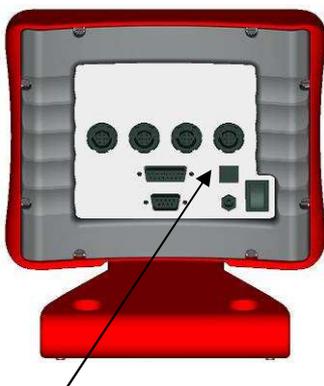
CONNECTING LEAD:- _____

A 9 way female to 9 way female null modem connecting lead is included with the T-Box for connection to a PC with a 9 way male connector.

TIP. If PC to be used has a 25 way 'D' connector, use the Serial Data Lead Kit (part no 60248).

SPECIFICATION - USB

The T-Box has two Universal Serial Bus (USB) connectors:

	USB-A (Device)	USB-B (Host)
Location		
To connect to	USB flash drive, USB mouse, USB keyboard, USB bar code scanner, USB printer, USB hub, etc.	PC, using the lead supplied. For connection to TDMS software.
Maximum power	1A	0A
Version	1.1	
Full speed	12 Mbps	
low speed	1.5 Mbps	

NOTE: *The T-Box is not designed to send data directly to a USB printer. Pass the data to a PC, then to a USB printer.*

When USB flash drive is used, files transferred are:

Text file on flash drive	Purpose
xxxxxxAudit (Where xxxxxx is the T-Box serial number)	Holds the T-Box history including Test result data
Instrument	Holds T-Box settings
Targets	Holds Target settings
Templates	Holds Tool Templates
Tools	Holds My Tools
Transducers	Holds Transducers

TIP. Targets, Templates, Tools & Transducers can be transferred to another T-Box instrument.
 1) Send files to flash drive. 2) Put flash drive into another T-box. 3) Send files from flash drive.

SPECIFICATION - MODES



TRACK:- _____

Display follows signal.



1st PEAK:- _____

Used for Click wrenches

Hold 1st peak for the 'AUTO RESET HOLD TIME', then reset.



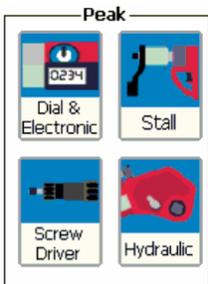
If 'Manual Reset' is selected torque will be reset when 'Reset' pressed or external ancillaries reset input active.

TIP. When calibrating ISO6789 Type II Torque tools, the standard calls for the time from 80% to the final target torque value shall take 0.5 to 4 seconds.

If from 80% to the final target torque value is under 0.5 seconds display will show:



If from 80% to the final target torque value is over 4 seconds display will show:



PEAK:- _____

For testing Pneutorques®, Hydraulic tools, Screwdrivers, Dial wrenches, etc

Hold the highest reading until reset.

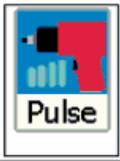


If 'Auto Reset' is selected the hold time starts when the value goes below 0.5% of full scale at zero.

TIP. Use the 'ACTIVE FROM' setting to ignore small torque readings that are not required.

Extra Features:- _____

Feature	Mode	Example	Comments
Torque rate	Click, Dial & Electronic, Stall and Hydraulic.	5.13 N·m/Rev	The torque applied per revolution (N.m/rev) or per degree (N.m/°), measured from the SNUG TORQUE value to the PEAK (or 1ST PEAK) TORQUE value. Requires: 1. Angle transducer. 2. Torque & Angle selected. 3. Target with Snug Torque set. 4. Target with Angle limits set.
Pulse count	Pulse and Screwdriver.	# 11	The number of pulses applied. Pulses are registered when the torque value passed through the active from threshold.



PULSE:- _____

This mode is for PULSE TOOLS only.



DO NOT USE WITH IMPACT TOOLS.



TIP. For best results do not change set up, keep Filter Frequency = 2500Hz and Active From = 4.8%.

TIP. For best results work above 20% of transducer capacity.

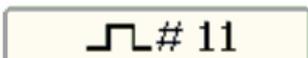
Pulse tools use air to operate a hydraulic mechanism that applies torque in a series of pulses.

- The final torque depends on:
1. The air tool type.
 2. The tool speed / air pressure.
 3. The mass of the hydraulic mechanism.
 4. The number of sockets & drive shafts absorbing energy.
 5. The joint rate (hard or soft joint).

Each pulse is measured and software analysis is used to determine the work done by the pulse and so determine the torque achieved.

Transducer mounting options	
Static transducer under joint simulator	Rotary transducer in front of bolted joint
<p style="text-align: right; margin-right: 20px;">Pulse tool</p> <p style="text-align: right; margin-right: 20px;">Socket(s)</p> <p style="text-align: right; margin-right: 20px;">Joint simulator</p>	<p style="text-align: right; margin-right: 20px;">Pulse tool</p> <p style="text-align: right; margin-right: 20px;">Socket(s)</p> <p style="text-align: right; margin-right: 20px;">Rotary transducer</p> <p style="text-align: right; margin-right: 20px;">Socket(s)</p> <p style="text-align: right; margin-right: 20px;">Bolted joint</p> <p style="margin-top: 10px;">Ensure rotary transducer brushes do NOT bounce.</p> <p style="margin-top: 10px;">Use a low mass rotary transducer to reduce the energy lost in accelerating the transducer with each pulse.</p>
<p>If the torque applied continually (e.g. with a torque wrench) the static transducer & rotary transducer match exactly.</p> <p>Keep the number of sockets and adaptors to a minimum. The sockets and adaptors are accelerated with each pulse, which absorb energy that would be used to tighten the joint.</p> <p>Ensure all sockets and adaptors have a tight fit. Any slack will result in lost energy, so less energy will be used to tighten the joint. Slack may also cause the sockets & adaptors to 'rattle'; this can cause extra pulses to be counted.</p> <p>It is important that different operators use the tool in a consistent way. If a pulse tool is firmly pushed against the joint then slack in the sockets and adaptors may be reduced, this will result in a different amount of torque being applied.</p>	

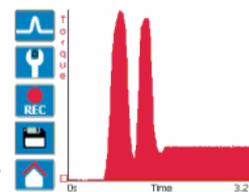
Pulse count is shown:





GRAPH:- _____

Graph mode		
Step	Action	Option
1	Select type	Single event:  Automatic start / stop to capture 1 fast event. Graph starts when torque goes above the 'Active From' setting. Graph stops when torque goes below the 'Active From' setting.
		Multi event:  Manual start / stop to capture 1 or more slower events. Graph starts when record (REC) pressed. Graph stops when stop pressed.
2	Graph data	 = Torque
		 = Torque & Angle
3	Record	
4	Measure	Display shows samples being taken: Samples : 40
5	Stop	
6	View	TOUCH screen to view torque against time. For angle transducer Angle against time is view. <u>For angle transducer:</u> DOUBLE TAP screen to view Torque against angle (torque rate). DOUBLE TAP screen to view Torque against speed.
7	Save	
8	Exit to measure	



TIP. Fitting your graph within 1000 points:
The graph mode can record 1000 points. Once 1000 points are taken, the graph starts again.
To avoid the graph starting again use a LOWER sample rate in graph mode SETUP.

TIP. If graph results are not detailed enough:
Increase SAMPLE RATE in graph mode SETUP.

SPECIFICATIONS – TARGETS

The T-Box has targets for both Torque and Angle value. Each Target has an Upper Limit & a Lower Limit.

Torque signal	Display icons	Display colour	Display example	Serial Port	Ancillaries
At zero	None	YELLOW		LO	Logic output Pin 3
Under lower limit.		YELLOW		LO	Logic output Pin 3
Within limits	None.	GREEN		OK	Logic output Pin 4
Above upper limit		RED		HI	Logic output Pin 5
Update rate	3Hz		3Hz	With serial port	208Hz

TIP. The Ancillaries are updated quickly to give a fast response to an external control system.

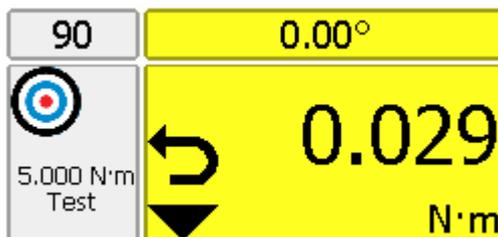
NOTE: This difference in update rate may lead to very small differences between the changeover points.

The limit operation is dependent on the measurement mode:

Measurement mode	Limit operation
Track	Limits follow the transducer input and are not held.
Click Dial & Electronic Stall Pulse Screw Driver Hydraulic	Limits status is held until: SAVE is pressed or RESET is pressed or after the auto reset timer has operated.

NOTE: - For operation of limits in one direction only, the opposite direction will be shown as LO.

If an angle target is selected, the value is shown above the torque display.



TIP. The T-Box will automatically change torque units to those set by the limits.

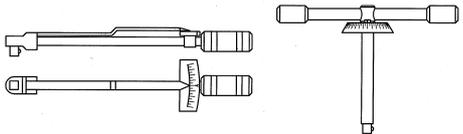
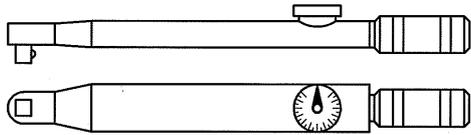
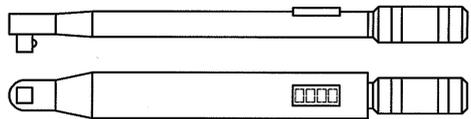
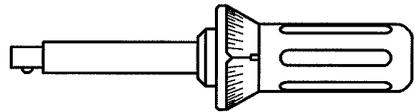
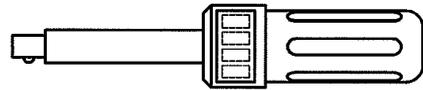
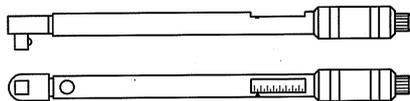
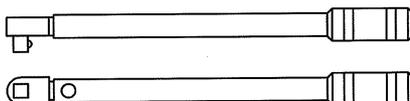
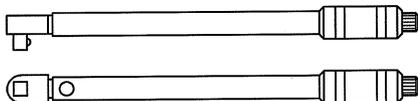
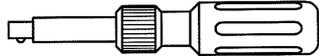
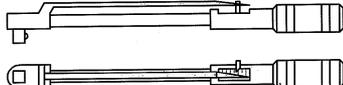
TIP. Limits can be set up in Custom Units for operation with transducers programmed with the same Custom units.

SPECIFICATION - HAND TORQUE TOOL CLASSIFICATION

The T-Box tool templates conform to ISO 6789:2003 classification for hand torque tools. A summary of the classifications are given below; for full details please refer to the ISO standard.

Tool Type I: Indicating torque tools (The torque exerted is indicates on scale, dial or display).

Tool Type II: Setting torque tools (A signal is given when the pre-set torque value is met).

Type	Class	Description:	Example:
I	A	Wrench, torsion or flexion bar.	
	B	Wrench, rigid housing, with scale or dial or display.	
	C	Wrench, rigid housing and electronic measurement.	
	D	Screwdriver, with scale or dial or display.	
	E	Screwdriver, with electronic measurement.	
II	A	Wrench, adjustable, graduated or with display.	
	B	Wrench, fixed adjustment.	
	C	Wrench, adjustable, non-graduated.	
	D	Screwdriver, adjustable, graduated or with display.	
	E	Screwdriver, fixed or adjustable.	
	F	Screwdriver, adjustable, non-graduated.	
	G	Wrench, flexion bar, adjustable, graduated.	

Each TOOL TYPE has several classes to determine the measurement points, number of measurements & permissible deviation.

Type	Class	Measurement points	Number of Measurements (at each point)	Permissible deviation (+/- %)	
				Max torque value $\leq 10\text{N.m}$	Max torque value $> 10\text{N.m}$
I	A	20 / 60 / 100	5	6	6
	B	20 / 60 / 100	5	6	4
	C	20 / 60 / 100	5	6	4
	D	20 / 60 / 100	5	6	6
	E	20 / 60 / 100	5	6	4
II	A	20 / 60 / 100	5	6	4
	B	At set point	5	6	4
	C	20 / 60 / 100	10	6	4
	D	20 / 60 / 100	5	6	6
	E	At set point	5	6	6
	F	20 / 60 / 100	10	6	6
	G	20 / 60 / 100	5	6	6

The T-Box automatically calculates the limits to ISO 6789:2003 by the following method:

$$\text{Deviation} = \frac{(\text{Target value} - \text{Displayed reading})}{\text{Displayed reading}} \times 100$$

If the 100% target value is set above 10 Nm, the deviation must be within $\pm 4\%$. For a 100% target value of 10 Nm or below, the deviation must be within $\pm 6\%$.

TIP. For a 100 Nm target value a displayed reading of 96.14 Nm is a fail:

$$\text{Deviation} = \frac{100 - 96.14}{96.14} \times 100 = 4.015\% \text{ (larger than } 4\% \text{ deviation).}$$

For a 100 Nm target value a displayed reading of 104.15 is a pass:

$$\text{Deviation} = \frac{100 - 104.15}{104.15} \times 100 = 3.985\% \text{ (smaller than } 4\% \text{ deviation).}$$

MAINTENANCE

T-BOX CALIBRATION:- _____

Your T-Box has been supplied with a certificate of calibration. To maintain the specified accuracy it is recommended that the T-Box is recalibrated at least once per year. Re-calibration should be carried out at Norbar or by a Norbar approved agent, where all the facilities to ensure the instrument is functioning at maximum accuracy are available.

Do not remove back panel or case; there are no calibration settings inside.

TRANSDUCER CALIBRATION:- _____

To maintain the specified accuracy it is recommended that transducers are recalibrated at least once per year. Re-calibration and repair should be carried out at Norbar or by a Norbar approved agent.

BATTERY REPLACEMENT:- _____

There are 2 batteries in this product. A custom battery pack for powering the T-Box (if the battery life is less than the specification it will require replacing) and a Coin cell to power the clock.

Batteries are to be replaced by Norbar or a Norbar approved agent.

REPAIR:- _____

Repair should be carried out at Norbar or by a Norbar approved agent, where all the facilities to ensure the instrument is functioning at maximum accuracy are available.

Do not remove the T-Box case; there are parts for operator repair inside.

CLEANING:- _____

Do not use abrasives or solvent based cleaners.

PRODUCT DISPOSAL:- _____



This symbol on the product indicates that it must not be disposed of in the general waste.

Please dispose of according to your local recycling laws and regulations.

Contact your distributor or see the Norbar web site (www.norbar.com) for further recycling information.

BATTERY DISPOSAL:- _____

This product contains 2 Batteries. Only dispose of batteries at end of product life.

To remove the batteries:

1. Switch off T-Box and remove DC input power.
2. Remove front transducer selection switch knob (2 mm Allen key needed).
3. Remove front transducer selection switch fixing nut and washer (11 mm hex socket needed).
4. Remove 8 back panel socket head cap screws (2.5 mm Allen key needed).
5. Ease back panel from case by pushing on the front transducer selection switch shaft.
6. Remove battery pack (from back panel) & button cell (from front PCB).

Batteries contain substances that can have a negative effect on the environment and human health.

The crossed-out wheeled bin means that batteries must NOT be disposed of in the general waste.

All batteries must be disposed of at a local waste battery collection point.

The batteries do NOT contain mercury (Hg), cadmium (Cd) or lead (Pb). If the battery substances exceed the legal limits the battery would be marked with Pb, Cd or Hg.

TROUBLE SHOOTING

Tips are located within the handbook to help with troubleshooting.
Common problems are listed below:

Problem	Likely Solutions
No T-Box display.	Check on/off switch is ON. In sleep – Press blue button on front. Charge battery for at least 1 minute.
T-Box only displays Logo.	Connection to TDMS. Remove Serial lead (RS232).
Battery only powers T-Box for a short time.	Charge battery for full charge time. Battery pack may need replacing.
Battery will not charge.	Check display has 'Mains' icon when charging. Check Power supply adaptor is ON (green light on adaptor will glow). Check electrical power supply and fuse in plug (if fitted).
Display background is RED.	Battery too low. Charge battery.
"TD1 Connect Transducer".	Non-smart transducer used. No transducer is detected or transducer cable faulty.
"TD1 Setup Transducer".	SMART transducer faulty. Return transducer to Norbar.
Date & Time not remembered.	The coin cell battery has failed. Return to Norbar.
Cannot zero transducer.	Ensure in TRACK mode. Transducer overstrain. Return defective transducer to Norbar.
Measurement modes do not function correctly.	Ensure the 'Active From' setting in Mode Setup is not too low or too high.
Password lost.	Contact Norbar.
T-Box locks up.	Turn off /on to reset configuration.
Click mode continuously triggers	Check the ZERO of the transducer in TRACK mode.
Cannot Transfer data to a USB stick	Do not use a USB U3 drive (Sandisk), the USB stick needs to be a standard one (like the one supplied with the T-Box).
Work Id is not remembered	Work Id's are only remembered for re-selection if a Target is in use when saving the readings.
Cannot separate 'As Found' and 'As Left' calibrations when viewing results on T-Box	Enter the Work Id 'As Found' and perform the calibration, then enter the Work Id 'As Left' and perform another calibration. This will separate the results when viewing / deleting.
Serial port problem.	See table on next page.

Serial Port Problem	Likely Solutions
Serial data output is not communicating with other equipment.	<ol style="list-style-type: none"> 1. Check that the baud rate is set to the same as the receiving equipment. 2. Check that all serial port parameters (Data bits, Stop bits, Parity & Flow Control) on the T-Box and the receiving equipment match. 3. Check the correct null modem serial lead is being used. 4. Check if receiving equipment requires 'First Character' or limits removed or units removed.
Serial printer losing data.	The printer is too slow for the fast data output; need to slow down T-Box. In 'Serial Port Setup' change "Line Delay' to a larger time.
Serial output is being overwritten.	Line feed required. In 'Serial Port Setup' change 'Output Line Feed' to 'TICK'.
Cannot communicate with Norbar 'Torque Wrench Calibration Software' (Part No 37705.XXX).	The software will not accept limit characters LO / OK / HI. In 'Serial Port Setup' change 'Output Limits' to 'UN-TICK'.
Serial data too slow.	Speed up by changing the LINE DELAY to 0 SECONDS.
Need to view serial output on PC.	Use the HyperTerminal® program found in Microsoft® Windows to view and store the serial output data. For more information see www.norbar.com and select FAQ.

For more complex faults please contact Norbar distributor / manufacturer.

GLOSSARY OF TERMS

Word or Term	Meaning
#	Number
a.c.	Alternating current.
Active From	Value from which the memory modes operate.
Auto Reset Hold Time	The length of time a reading is displayed until automatically reset.
CAL	Calibration
Capacity	Transducer full scale.
Custom Calibration	A calibration that is not to ISO 6789.
Custom Units	Allow load cells and other non-torque transducers to be used.
d.c.	Direct current.
ETS	Electronic Transducer System (obsolete product).
First Peak Sensitivity	The amount by which the reading must fall below the peak for the display to be held.
Frequency Response	Frequency value below which signals are passed.
Hz	Hertz, unit of frequency.
ISO Calibration	A calibration to ISO 6789.
KB	Kilobyte – Amount of memory.
Lemo	Reference for manufacturers of connector.
mA	milli amp; One thousandth of an amp (0.01A).
MB	Megabyte – Amount of digital memory.
mAh	milli ampere hour; Rate of charge/discharge of a battery.
mS	Millisecond; One thousandth of a second (0.001 second).
mV	Millivolt; One thousandth of a volt (0.001 volt).
mV/V	Millivolt per volt; Ratio of millivolt output to voltage input.
My Tools	Database of the tools used.
NON-SMART	Standard mV/V transducer (NON-INTELLIGENT).
PC	Personal Computer.
Pulse Count	The number of torque pulses applied in Pulse mode or Screwdriver mode.
Sample Rate	Number of measurement samples taken in 1 second.
Sleep After	The time after, when not used, the T-Box goes to sleep; this will save battery power.
SMART	Serial Memory Automatic Recognition Transducer (INTELLIGENT).
SMART Transducer	A transducer that holds its own calibration data (INTELLIGENT).
Snug Torque	Torque value to start measuring angle.
Target	Torque or Angle value required. Each Target has an Upper Limit & a Lower Limit.
TDMS	Torque Data Management System – Software included for PC use.
Tool	A reference to the tool being calibrated or used. E.G: Torque wrenches, Pneuturques®, Electric tools, Torque screwdrivers, etc.
Tool Templates	A template holding full details of the tool. All Norbar tools are included.
Torque Rate	The torque applied per revolution (N.m/rev); measured from the SNUG TORQUE value to the PEAK (or 1ST PEAK) TORQUE value.
USB	Universal Serial Bus.
V	Volts
Work Id	Work identification - the reference to the task, application or job. E.g.: a bolted flange, engine cylinder head, vehicle wheel nuts, etc.
Zero Suppression	Value of torque that has to be achieved for the T-Box not to display zero.