TYPE 5867
PORTABLE ‘Q’ METER

OPERATING INSTRUCTIONS

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PRECISION INSTRUMENTS

IMPORTANT: Please read these instructions carefully before operating instrument

SUBJECT TO CHANGE WITHOUT NOTICE
This manual superseded all previous versions – please keep for future reference

TINSLEY, A DIVISION OF HARTEST PRECISION INSTRUMENTS LTD

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CONTENTS

1. INTRODUCTION

The 5867 is an accurate bench/portable digital 'Q' meter for the measurement of the 'Q' value of wound components, e.g. Transformers and rotating electrical machine windings. This provides the ability to determine the presence of shorted turns in a winding. The Q value may be described as a figure reflecting the resonance of the inductance, capacitance and resistance components of the transformer under test. The measured values are displayed on a 8-Digit high visibility dot matrix display. The 5867 utilises simple button operation and features warning lights which are illuminated when appropriate.

Accessories supplied as standard:

1 mains cord

1 operating instructions (English)

2 test leads (colour coded), length 3m each, supplied with selection of connectors

When unpacked, inspect for physical damage and report any defects immediately in writing, retaining packaging materials for inspection. This unit has been designed to operate at different mains voltages, ranging from 90 – 260V AC.

2. SAFETY

This apparatus is designated Safety Class I as defined in the IEC publication 348.

This apparatus has been designed and tested in accordance with IEC Publication 348, entitled "Safety Requirements for Electronic Measuring Apparatus" and has been supplied in a safe condition. The present instruction manual contains some information and warnings which must be followed by the user to ensure safe operation and to retain the apparatus in safe condition.

The mains plug shall only be inserted in a socket outlet provided with protective earth contact.

WARNING

When the apparatus is connected to its mains supply and the covers are opened, it is likely to expose live parts.

The apparatus must be disconnected from all voltage sources before it is opened for any adjustment, replacement, maintenance or repair.

Any adjustment, maintenance or repair of the opened apparatus under voltage shall be avoided as far as possible, and if inevitable, shall be carried out only by a skilled person who is aware of the hazard involved.

Make sure that only fuses with the required current rating and of the specified type are used for replacement. The use of makeshift fuses, and the short circuiting of fuse holders is prohibited.

Whenever it is likely that the protection has been impaired, the apparatus shall be made inoperative and be secured against any unintended operation and returned to our factory or agent for rectification.

3. CASE DESIGN

The case is ruggedly constructed from an ABS/polycarbonate alloy. A strong internal sub frame ensures that the 5867 will withstand the harshest of environments. The front panel is a reverse printed polycarbonate overlay with clear and unambiguous text.

4. SPECIFICATION

Digital display	8 digit, LED 0.8" height Range indicator, 999 count and status indicators via 3 LED's
Working temperature	0…+40°C Relative Humidity max. 80%
Normal temperature	20°C
Oven temperature	40°C
Storage temperature	-20°C…+50°C
Mains connection	90 - 260V
Size (mm)	24 x 28 x 12cm
Weight	4.5 kg
Measuring frequency	250ms

5. MAINTENANCE

Normally no maintenance is required other than cleaning with a moist cloth. Avoid aggressive detergents or solvents.

CAUTION: Before any maintenance, repair or exchange of parts or fuses, the instrument must be disconnected from the mains supply and all power sources. In the event of a fault occurring, the instrument should be returned to our factory or agent. A mains fuse is fitted to the mains inlet socket on the front panel, and should be replaced if necessary.

CAUTION: Disconnect mains lead and all connecting leads, before removing fuse holder. Replace only with the correct fuse type, i.ee according to the following chart.

Line Voltage Selection	Range VAC 47-63Hz	Fuse (250V) IEC 127 5 x 20mm
100V 120V	87-110V 104-132V	1A (T)
220V 240V	191-242V 209-264V	1A (T)

6. BATTERY CHARGING

The 5867 has built-in rechargeable sealed lead acid batteries which are fully charged when delivered. To indicate the state of charge, 8 LED's indicate the remaining battery capacity in % of full charge.

The battery charger is built-in and the instrument may be connected to a voltage supply of between 90 to 260V AC. The instrument may be operated with a flat battery, provided that the unit is powered to the mains – in this way the unit can be simultaneously operated and charged. If the unit is switched on and the battery is not sufficiently charged, the unit will turn itself off automatically. To conserve the battery, if no key is pressed during a 20 minute period the unit will also switch itself off. To protect the battery from complete discharge below a minimum capacity the unit will self power off.

Charging is automatically controlled with built-in protection circuits eliminating the possibility of over charging.

The unit will be fully recharged in 8 hours without being used at the same time.

A fully charged unit should allow continuous operation for a working day, without the need to connect to the mains.

BATTERIES

The internal batteries are a sealed lead acid type. Care should be taken when disposing of them and they may be returned to Tinsley for safe disposal.

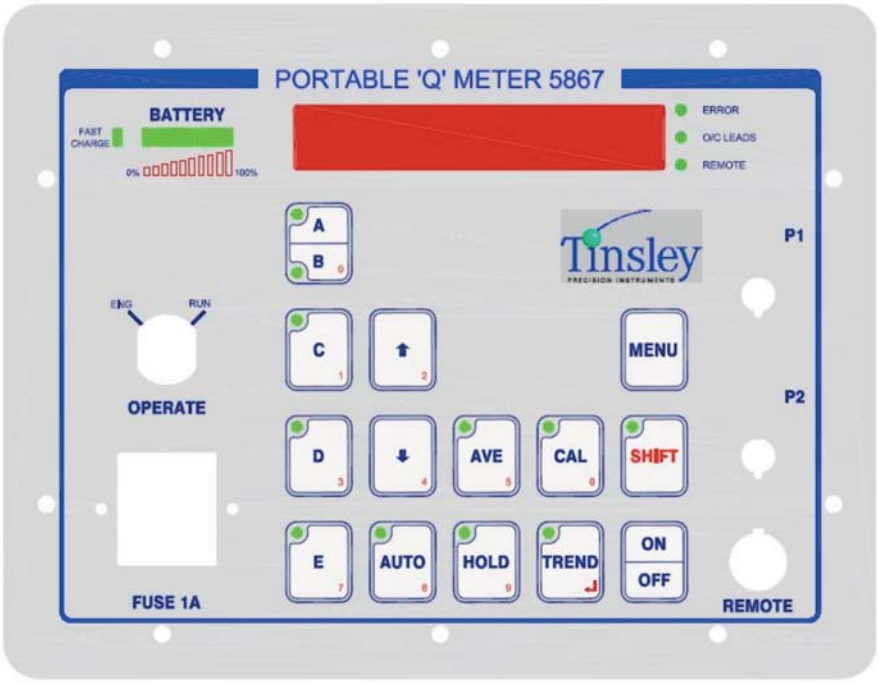
Any regulations and directions applying to the disposal of such material must be applied.

- Do not dispose of battery in fire
- Do not short circuit
- Do not crush, puncture, open, dismantle or otherwise mechanically interfere with the battery.

NOTE: If storing for long periods, the batteries should be fully recharged every six months.

7. OPERATION

When the 5867 is first switched on, the display will indicate the model number, followed by the version and then followed by the internal temperature of the unit. The display will then show which capacitance range and measuring range was last used and this will be shown on the display until it is next changed by the operator. The last used capacitance range will also be indicated by an illuminated LED on the relevant key.



Note: This drawing represents issue 2. Issue 3 includes the following modifications: 1. ERROR LED is now OVEN LED. 2. TREND key is now USER key.

Connect Q meter to a wound unit under test (UUT):

The 2 leads supplied are colour coded – plug the relevant lead into the relevant input on the instrument (P1, P2). Note: These are colour coded for simplicity but it does not matter to the reading if they are interchanged. Connect the other ends of the 2 leads onto UUT.

Turn on Q meter:

By pressing the On/Off button.

Capacitance Sensitivity:

Select the required range by pressing one of the keys marked A to E. The selected range is indicated by an LED. In the case of ranges A and B, this is located on one key which may be toggled. Press it once for range A and twice for B. The range should be selected to match the UUT type being used. As an indication, a more sensitive reading required means that a smaller capacitance value should be selected – see list below for capacitances.

A: 100µF

B: 10µF

C: 1µF

D: 100nF

E: 10nF

Note: When the unit is switched on, the last capacitance setting is remembered.

Range Selection:

Dependant on the inductance of the UUT, there are 15 ranges of which 1 is the most sensitive and 15 is the least sensitive. There are two ways in which the range can be adjusted:

Manually: using the up and down arrow keys

Automatically: pressing the Auto key. This will automatically choose the most appropriate range

As a guide, if there is too much signal, "999" will be displayed (i.e. over range) and the O/C leads LED will be illuminated, indicating that a higher range should be selected, which can be achieved by pressing the up arrow key. A suitable range, as would be chosen by the Auto range method described above, would be to pick a range that displays a value of between 500 and 999 (over range). When a reading of less than 500 is displayed, there may not be enough signal. In this case a lower range should be selected, which can be achieved by pressing the down arrow key.

The choice of the correct combination of Capacitance Sensitivity and Range Selection, is best found by experience in the testing of similar UUT's. It is then possible to use the instrument as a comparator if there are many UUT's at the time of test that are identical, OR as a pass/fail against a known standard, if there if only one UUT that is identical to the standard.

Hold key:

Select this to hold the current displayed value.

Ave. key:

Select this to put the unit into Average Mode. The key should be pressed and held whilst it scrolls through the number of reads over which to average – i.e. 2, 4, 8, 16 or off. For example, if 2 is chosen, then the mean result of 2 reads will be taken and then displayed. This can be used to filter noisy readings and to provide a stable, accurate result.

Cal. key:

This can be pressed at any time and it isolates the output while it undertakes a quick internal calibration.

User key:

This allows the oven facility to be turned on and off. The oven maintains the instrument's precision components at a stable and uniform 40°C. When the button is pressed, the OVEN LED will light to indicate that the oven has been turned on. When it has reached within 5°C of the 40°C the LED will flash. When it is within it's 40°C band the LED switches off. If the oven is turned on when the "user" button is pressed, the temperature will be displayed. The button may be pressed again to turn off the oven.

Note: The Shift key is reserved for future use.

Status LED's:

These LED's will light to indicate the instrument status:

OVEN:	This illuminates when the oven is heating (see section above, titled "Oven". This will flash when the oven is within 5°C of the standard 40°C.
REMOTE:	This illuminates when the Q meter is being controlled remotely and is lit whilst commands are being transferred via an RS232 link.
O/C LEAD:	One of the measuring leads is open circuit or is not connected to the transformer correctly, or the selected range is too small.
FAST CHARGE:	When the unit is being charged from the mains (and whilst the battery is still partially discharged) this LED will illuminate. It will go off when the battery is approaching its fully charged state.

Switch key:

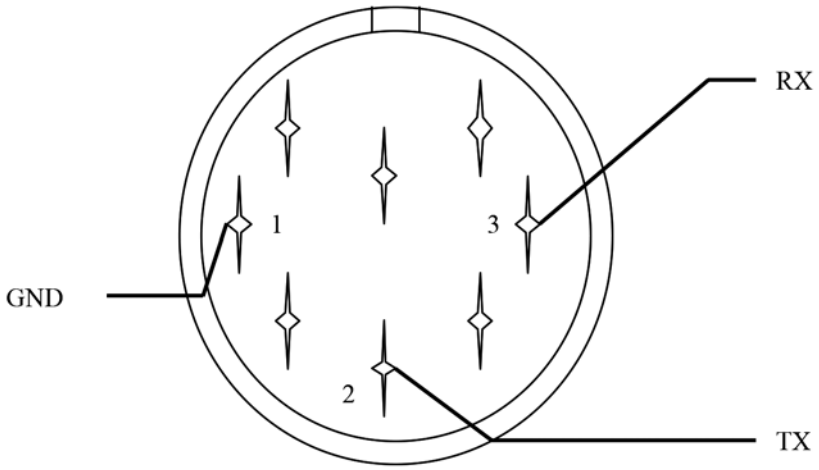
In normal operation, the key position should be set to RUN. For an engineer to programme values in, the key should be switched to the ENG position.

8. REMOTE OUTPUT

The RS232 plug should be connected here (via an RS232/DIN connector adaptor).

The digital output is a 38400baud* N 8 1 serial interface. The RX & TX conform to the EIA RS232 standard of +15 to +5v (Logic Low) and –15 to –5v (Logic High).

* Can be set in the menu for the instrument.



REMOTE DIN (Front panel view)

RS232 commands		Function	Remarks
?	63dec	Help menu	Send this list
K	75dec	Get for model version & board issues	
S	83dec	Get internal status	Send 6 bytes
D	68dec	Get current instrument display value	Range+Gain+reading (6 bytes)
R	82dec	Read next value or force read	Range+Gain+reading (6 bytes)
Gxn	71dec	Set Range & Gain where x=A/B/C/D/E & n=0 to 15.	Responds with xn
T	84dec	Get Internal Temperature	'TempCo = xC'
C	67dec	Do Calibration cycle	
A	65dec	Get Internal Voltages	
I	73dec	Get Unit Itent string	'Tinsley,5867,xVx'
L{OPT}		Start logging readings QPT –Output Format Q=value, P = Reading interval, T = temp	Q,xxx,P,xxx,T,xxx where value is present (xxx) if QPT are specified.
P{x,y}		Set pulse duration charge, read	** Engineering mode only
E{x}		Eeprom diagnostics where x is P – dump to serial channel D – Reset to default C = Clear	** Engineering mode only
W{x}		Run diagnostics function F – Flash all LEDS P – Set processor port to x 1 – Strobe on 0 – Strobe off Q – Power off Rnx – relay n on(1) off(0) i.e. R20 – Relay 2 off. Ax – Get ADC channel x value	** Engineering mode only

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