



Australian Government
Department of Industry,
Innovation and Science

National Measurement Institute

Supplementary Certificate of Approval NMI S407

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

Liquip Model EMH 600 Calculator/Indicator for Liquid-measuring Systems

submitted by Liquip International Pty Limited
 13 Hume Road
 Smithfield NSW 2164

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI R 117-1, Measuring Systems for Liquids Other than Water, dated July 2004.

This approval becomes subject to review on 1/08/17, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 provisionally approved – interim certificate issued	12/07/02
1	Pattern & variant 1 approved – interim certificate issued	12/03/03
2	Pattern & variant 1 approved – certificate issued	16/05/03
3	Pattern & variant 1 amended – notification of change issued	10/02/05
4	Variant 2 approved – interim certificate issued	5/08/05
5	Variant 2 approved – certificate issued	5/09/05
6	Pattern & variants 1 & 2 amended – notification of change issued	22/05/08

DOCUMENT HISTORY (cont...)

Rev	Reason/Details	Date
7	Variant 3 approved – certificate issued	10/03/09
8	Variant 4 provisionally approved – interim certificate issued	2/12/11
9	Pattern & variants 1 to 3 reviewed & updated – variant 4 approved – certificate issued	24/02/12
10	Pattern amended (Test Procedure) – certificate issued	8/08/13
11	Variant 4 amended (software version) – certificate issued	03/07/14
12	Variant 5 approved – certificate issued	20/10/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with approval number 'NMI (or NSC) S407' and only by persons authorised by the submittor.

Instruments incorporating a component purporting to comply with this approval shall be marked 'NMI (or NSC) S407' in addition to the approval number of the instrument, and only by persons authorised by the submittor.

Instruments purporting to comply with this approval and currently marked 'NMI (or NSC) PS407' may be re-marked 'NMI (or NSC) S407' but only by persons authorised by the submittor.

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificates No S1/0/A or No S1/0B.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.



Dr A Rawlinson

TECHNICAL SCHEDULE No S407

1. Description of Pattern **approved on 12/03/03**

The pattern is a Liquip model EMH 600 calculator/indicator (Figure 1) with integral pulse transmitter for use in liquid-measuring systems incorporating compatible (#) NMI-approved vehicle-mounted flowmeters.

(#) 'Compatible' is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system.

1.1 Field of Operation

The field of operation of the pattern is determined by the following characteristics:

- Input pulse rate less than 417 Hz/channel
- Input voltage ranges:
 - for the calculator/indicator 9 V DC to 30 V DC
 - for the pulse generator 9 V DC to 30 V DC
 - for the printer 20.4 V DC to 28.6 V DC
- Liquid temperature range -10°C to 50°C
- Environment temperature ranges:
 - for the calculator/indicator -25°C to 55°C
 - for printers -10°C to 40°C
- Non-linearity correction facility
- Density range for volume conversion to 15°C:
 - for generalised products 0.653 kg/L to 1.075 kg/L
 - for LPG 0.500 kg/L to 0.600 kg/L

1.2 Indicator

The model EMH-600 (Figure 1) with software version 11.01.xx includes an alphanumeric liquid crystal display with the following maximum volume display:

- 99 999.9 L when the resolution is set to 0.1
- 9 999 999 L when the resolution is set to 1
- 9 999 999 daL when the resolution is set to 10 for displaying in dekalitres (*)

(*) This setting may only be selected for non-trade applications.

The accumulated total is displayed up to 99 999 999 L before rolling over to 0. The total can be reset to zero via the calibration mode.

1.3 Features

The instrument is configured via the Mode and Cal switches, which have provision for sealing. The instrument can be configured to display the temperature of the liquid, the set density, and the volume at 15°C. It can either be configured to use the base k-factor for converting the input pulses to volume throughput or use multi k-factors as a function of input frequency (flow rate) to adjust the accuracy of the measurement transducer as a function of flow rate.

The instrument features the following functions:

- The TOTAL button displays the accumulative total. When the indication is set to display in decimal, the decimal part of the accumulative total can be viewed by pressing the TOTAL button immediately followed by the STOP/START button.
- The RESET button prints a delivery report and resets the register to zero. Pressing the RESET button during delivery will display the flow rate.
- Pressing the TOTAL button and then the RESET button will print management information. This will reset the power interrupts and delivery number to zero, without resetting the indication to zero.
- When interfaced to a flow control valve, the STOP/START button will begin a delivery or restart a delivery from the point at which it was stopped.
- Pressing the TOTAL button twice will display the unconverted volume.
- Pressing the TOTAL button five times will display the product temperature.

However, if remote density setting is enabled, pressing the TOTALS five times will now display the density which can be changed using the TOTALS and RESET buttons and can be saved by pressing the STOP/START button. In this mode, the product temperature can be displayed by first displaying the density and then pressing the RESET button three times. Thereafter, pressing the RESET button displays the meter number 'MeNo', and then the 'REPORT?N' option which enables the printing of the configuration parameters.

Note that the displayed density can only be changed when the delivery has been reset to zero.

1.4 Pulse Generator

The integral pulse transmitter comprises a 25-slot disk with three optic sensors to provide a three-channel pulse output. The calculator uses the rising and falling edge of the pulse from each channel to obtain a total count of 150 pulses per shaft revolution of the pulse generator. The maximum shaft speed for the pulse generator is 1000 revolutions per minute at which the calculator produces 2500 counts per second.

1.5 Calibration

The model EMH 600 calculator/indicator is configured either for a single k-factor or up to eight k-factors to define the relationship between the volume throughput and the pulses generated by the measurement transducer.

There are two ranges for the k-factor; the instrument is configured either for ST mode or EX mode, which define the following ranges of k-factor settings:

ST 1 to 999.9999 pulses/litre

EX 1000 to 9999.999 pulses/litre

To adjust the volume delivered by the measurement transducer, change the current k-factor using the following formula:

$$\text{New k-factor} = (1 + \% \text{ Error} / 100) \times \text{current k-factor}$$

Note: The EMH 600 limits the variation between any two k-factors to $\pm 0.25\%$.

1.6 Checking Facilities

The instrument incorporates the following checking facilities:

- A segment check is performed on the display only at power up. An easily accessible power switch is located on the vehicle to enable the checking of the segments before each delivery, should this be required.
- A check of the presence and of the correct signal output from the measurement transducer.
- Outputs are provided to control the delivery process and if necessary prevent measurements when errors are detected.
- When the indication reaches 90% of the maximum indication the display starts flashing and shutdown of the solenoid valves is commenced to prevent the indication from rolling over to zero.
- When configured for use with a printer, the EMH 600 checks for the presence and correct operation of the printer.

1.7 Volume Conversion for Temperature Facility

An electronic volume conversion for temperature facility is used to convert the measured volume to volume at 15°C. Activation of the volume conversion feature is indicated by the □ symbol in the top left corner of the display and is activated via the management mode for the approved products. The conversion is based on ASTMIP-API Petroleum Measurement Table 54 for LPG or Table 54B for Generalised Petroleum Products.

The density is either fixed via the calibration mode or is available for adjustment using the TOTALS button prior to measurements taking place. In such applications, temperature measurement is required which can be displayed by the EMH 600.

For temperature measurement, a Liquip part number 4155, PT100 4-wire RTD probe, which has a resistance of 100 ohms at 0°C can be used, or any other compatible (#) temperature probe with similar characteristics.

When displaying the volume at 15°C, the EMH 600 is connected to a Liquip Touchstar Blaster model BD422003-C17 printer (Figure 2a) or to an Epsom model TM-295 printer (Figure 2b) or to any other equivalent (*) printer.

If the nature of the measured volume is entered into the calculator/indicator at the beginning of the measurement operation, then a printer is mandatory for printing the delivery details and the manually-entered density for which the volume conversion is set.

- (#) 'Compatible' is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system.
- (*) "Equivalent" is defined to mean other proprietary equipment of the same or better specifications requiring no changes to software for satisfactory operation of the complete system.

Notes:

1. The above printers must be situated in a location that will satisfy the temperature requirements of -10°C to 40°C.
2. Where the vehicle battery supply is 12 V, a voltage doubler such as the Liquip model BBC101 is required.

1.8 Flow Control Valve

Any compatible solenoid-operated flow control valve, located downstream of the flowmeter, may be interfaced to the instrument for controlling the delivery process and to stop measurements in the event of errors detected by the checking facility.

1.9 Verification Provision

Provision is made for the application of a verification mark.

1.10 Sealing Provision

Access to the calibration parameters is via the two front panel brass configuration plugs (Figure 1), which have provision to be sealed using wire and lead. Additionally, the four screws affixing the cover of the indicator (Figure 1) have provision to be sealed with wire and lead.

1.11 Descriptive Markings and Notices

Instruments are marked with the following data, together in one location, in the form shown at right:

Manufacturer's mark, or name written in full
Model number
Serial number
Pattern approval mark	NMI (or NSC) No S407
Year of manufacture
Accuracy class	0.5 or 1.0
Environmental class	I (#1)
Liquid temperature range°C to°C (#2)

(#1) Environmental class for printers is Class B

(#2) Required when the volume conversion for temperature facility is activated

For applications other than LPG, when the volume conversion facility is activated, the indicator reading face shall be marked 'Litres at 15°C' or 'Volume at 15°C'.

The minimum measured quantity specified for the fuel dispenser is marked or displayed on the face of the indicator in the form 'Minimum Delivery 1000 L'.

2. Description of Variant 1

approved on 12/03/03

Liquip model EMH 600RP calculator/indicator with a Liquip model ERP 100 remote pulse transmitter (Figure 3a) which has the same features and functions as the pulser as described for the pattern in clause **1.4 Pulse Generator**.

3. Description of Variant 2

approved on 5/08/05

The Liquip model EMH 600H-MP calculator/indicator with software version 11.05.xx, which is similar to the pattern except it incorporates a multi-product selection feature for applications other than LPG. The software allows one of up to 12 products to be selected, each product is characterised by density and k-factor values pre-set in the calculator/indicator and used to correct and/or convert the volume measured by the flowmeter.

With the calculator/indicator in stand-by mode, a product can be selected by pressing the TOTAL button 5 times to access the multi-product feature. Thereafter pressing the TOTAL button the display scrolls through the available products for selection. The desired product is selected and stored by pressing the START/STOP button, and the calculator/indicator returns to the stand-by mode.

In stand-by mode it is possible to also access other features. Pressing the TOTAL button 5 times to access to the multi-product feature, if now the RESET button is pressed the product temperature is displayed. Thereafter, pressing the RESET button displays the meter number 'MeNo', and the 'REPORT?N' option which enables the printing of the software version number and the configuration parameters.

When the multi-product feature is used, the non-linearity correction feature is not accessible.

Note: A printer connected to the calculator/indicator is mandatory when using the multi-product feature.

3.1 Operational Procedure

- Press the start button to display the current product in memory.
- If another product is required other than the current one, scroll through the alternate products by pressing the TOTAL button until the desired product is viewed on the display.
- Press the START button again to confirm the product selection (the register then sends a signal to open the valve and allow the flow of liquid to the transfer point).
- Pull the trigger of the nozzle to commence the delivery.
- Release the trigger of the nozzle to terminate a delivery then press the RESET button (the register will then send a signal to close the valve), to print the last delivery and to reset the display to zero.

4. Description of Variant 3

approved on 9/03/09

With the Liquip model ERP 200 pulse transmitter (Figure 3b) which has the same features and functions as the model ERP 100) and as described in clause **1.4 Pulse Generator**. The lid of the housing is now not screwed on but is fixed to the main body by three bolts, one of which has provision for sealing.

5. Description of Variant 4

approved on 24/02/12
amended 03/07/14

A Liquip model EMH 600 calculator/indicator connected via a Liquip model DPI100 interface (Figure 4) to an NMI-approved ACME VTM series dual coil turbine flowmeter (as described in the documentation of approval NMI 10/2/6A) or to any compatible (#) approved dual channel pulse generator.

The model EMH 600 calculator/indicator now has version 11.02.**04**.xx software.

- (#) 'Compatible' is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system.

6. Description of Variant 5

approved on 20/10/16

The DreamTec model i-meter GPS tracking module (Figure 5) or similar models connects to the printer output of the EMH 600 series of calculators/indicators.

The i-meter sends information from the calculator/indicator to the source location. The i-meter transmits GPS locations and delivery data from the delivery truck. The customer is able to download PDF delivery notes for invoicing as well as GPS records.

TEST PROCEDURE No S407

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

Maximum Permissible Errors

The maximum permissible errors applicable are those applicable to the fuel dispensers to which the instrument approved herein is fitted, as stated in the approval documentation for the fuel dispensers or in Schedule 1 of the *National Trade Measurement Regulations 2009*.

FIGURE S407 – 1



Liquip Model EMH 600 Calculator/Indicator
for Liquid-measuring Systems (Pattern)

FIGURE S407 – 2



(a) Blaster Model BD422003-C17 Printer (Pattern)



(b) Epson Model TM-295 Printer (Pattern)

FIGURE S407 – 3

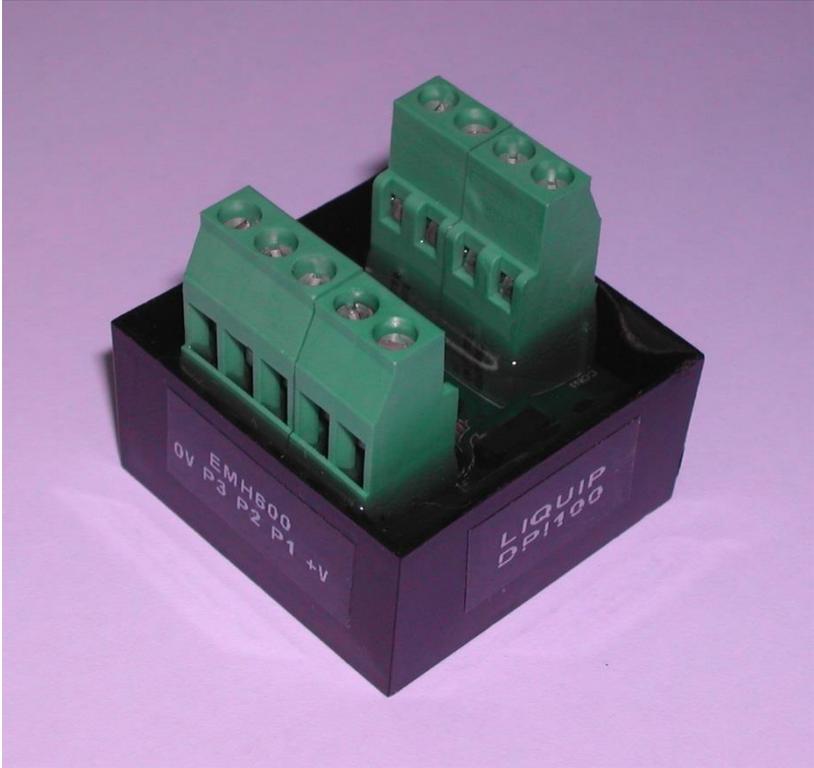


(a) Liquip Model ERP 100 Remote Pulse Transmitter (Variant 1)



(b) Liquip Model ERP 200 Pulse Transmitter (Variant 3)

FIGURE S407 – 4



Liquip Model DPI100 Interface (Variant 4)

FIGURE S407 – 5



DreamTec Model i-meter GPS Tracking Module (Variant 5)

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