Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

Supplementary Certificate of Approval

NMI S351A

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 500H Calculator/Indicator for Liquid-measuring Systems

submitted by Liquip International Pty Ltd
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 **1/09/21**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 4 approved – interim certificate issued	5/08/05
1	Pattern & variants 1 to 4 approved – certificate issued	5/10/05
2	Variant 5 approved – interim certificate issued	24/02/09
3	Variants 5 & 6 approved – certificate issued	10/03/09
4	Pattern & variant 1 reviewed– notification of change issued	21/01/11
5	Pattern & variants 1 to 6 **reviewed** & updated – variant 7 approved – certificate issued	12/09/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI S315A' and only by persons authorised by the submittor.

Instruments incorporating a component purporting to comply with this approval shall be marked 'NMI S315A' in addition to the approval number of the instrument, and 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 S351A

1. Description of Pattern **approved on 5/08/05**

The pattern is a Liquip model EMH 500H calculator/indicator with integral pulse transmitter for use in liquid measuring systems incorporating compatible approved flow meters in vehicle-mounted installations.

1.1 Field of Operation

The field of operation for the instrument is characterised by the following:

• Input pulse rate	less than 417 Hz/channel
• Input voltage range:	
for the calculator/indicator and the pulse generator	9 V DC to 30 V DC
for the printers	20.4 V DC to 28.6 V DC
• Liquid temperature range	–15ºC to 55ºC
• Environmental temperature range:	
for the calculator/indicator and the pulse generator	–25ºC to 55ºC
for the printers	–10°C to 40°C
• Non-linearity correction facility	Up to 8 K-Factors
• Accuracy class:	
for Generalised petroleum products	Class 0.3
for LPG applications	Class 1.0
• Density range for volume conversion to 15ºC:	
for Generalised petroleum products	0.653 kg/L to 1.075 kg/L
for LPG applications	0.505 kg/L to 0.585 kg/L

1.2 Calculator/Indicator

The Liquip model EMH 500H calculator/indicator (Figure 1) with software version 01.01.30 comprises two alphanumeric liquid crystal displays (known as Lampex model LMO8106 Revision A) attached to a Liquip model EMH500-DS version 1.3 circuit board.

The volume display can be set to indicate the following maximum volumes:

99 999.9 L when the resolution is set to 0.1 L.

9 999 999 L when the resolution is set to 1 L.

9 999 999 daL when the resolution is set to 10 L for displaying in dekalitres (*)

(*) This setting may only be selected for applications which are not for trade use.

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

1.3 Operational Features

Typical operation:

- 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 resets the register to zero. Pressing the RESET button during delivery will display the flow rate.
- 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.

1.4 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 of, and 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 500H checks for the presence and correct operation of the printer.
- If the volume conversion for temperature facility is activated, and the temperature probe fails during a delivery the □□ symbol in the top left corner of the display blinks and ‘TEMPERATURE PROBE DISCONNECTED’ will be printed on the delivery docket.

1.5 Calibration Configuration

The EMH 500H calculator/indicator is configured via the Mode and Cal switches, which have provision for sealing. The instrument can either be configured to use the base K-Factor for converting the input pulses to volume throughput or to use up to eight K-Factors as a function of input frequency (flow rate) to adjust the accuracy of the measurement transducer as a function of flow rate (non-linearity correction facility).

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:

New K-Factor = (1 + % Error / 100) x current K-Factor.

Note: The EMH 500H limits the variation between any two K-Factor to ±0.25%.

1.6 Volume Conversion for Temperature Facility

The electronic volume conversion for temperature facility can be enabled via the management mode to convert the measured volume to volume at 15°C. The volume conversion feature is activated when the □□ symbol in the top left corner of the indicator is displayed.

The calculator/indicator incorporates ASTM-IP-API Petroleum Measurement Table 53B with density range 0.653 to 1.075 kg/L and Table 54 B with density range 0.500 to 0.600 kg/L.

For LPG applications, the density setting is limited to the range 0.505 to 0.585 kg/L based on the density of pure Propane (0.5073 kg/L) and pure n-Butane (0.5841 kg/L) as defined by Gas Processors Association (GPA) Standard 2145-96.

For liquid temperature measurement, a Liquip part number 4155, PT100 4-wire RTD probe, which has a resistance of 100 ohms at 0°C, or any other compatible temperature probe with similar characteristics, is installed as close as practicable to the flowmeter.

The density setting is either fixed via the calibration mode, or the density setting is available for adjustment using the TOTALS button prior to measurements taking place.

Temperature measurement is required and can be displayed by the EMH 500H. In addition, a printer is mandatory for printing the delivery details and the manually entered density for which the volume conversion is set.

The instrument can be configured to display the set density, the volume at 15ºC, and the measured temperature of the liquid. The instrument features the following functions:

- The RESET button prints a delivery report and resets the register to zero.
- 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.
- Pressing the TOTAL button twice will display the unconverted volume.
- Pressing the TOTAL button 5 times will display the product temperature. However if remote density setting is enabled, pressing the TOTALS 5 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 3 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.

1.7 Power Supply

The calculator/indicator operates on a nominal 24 V DC power supply and is approved with a Liquip model EJB101 version 1.2 power junction box (Figure 2) which incorporates relays for optional control of two stage flow control valves. In case of 12 V truck installations, an additional power supply is necessary for the printer. The power supply may be a simple voltage doubler, or a Liquip BBC101 backup unit, or equivalent.

1.8 Pulse Transmitter

The integral pulse transmitter comprises a 25-slot disk with three optic sensors to provide a three-channel pulse output. The calculator/indicator 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.

1.9 Printers

When displaying the volume at 15ºC, the EMH 500H is connected to either a Liquip Touchstar Blaster model BD422003-C17 printer (Figure 3), or to an Epson model TM-295 printer (Figure 4) or any other compatible approved printer, to provide printout of parameter setting and software version.

If the density is entered into the calculator/indicator at the beginning of the measurement operation, then a printed receipt shall be given on the completion of the measurement operation.

Notes:

1. The above printers must be situated in a location that will satisfy the temperature requirements of –10°C to 40°C; and
2. In case of 12V truck installations, an additional power supply is necessary for the printer. The power supply may be a simple voltage doubler, or a Liquip BBC101 backup unit, or equivalent.

1.10 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.

1.11 Markings and Notices

The following information shall be clearly and permanently marked on one or more permanently attached nameplates:

Manufacturer's name or mark	Liquip International
Model number	EMH 500H
Serial number	.....
Year of manufacture	.....
Pattern approval number	NMI S351A
Density range:	
for use with LPG	0.505 kg/L to 585 kg/L
for use with Generalised products	0.653 kg/L to 1.075 kg/L
Liquid temperature range	–15°C to 55°C
Environmental class:	
for the calculator/indicator	Class I
for printers	Class B

When the volume conversion device is activated, the indicator reading face shall be marked 'Litres at 15°C' or 'Volume at 15ºC'.

The minimum measured quantity specified for the meter shall be displayed on the indicator (e.g. in the form 'Minimum delivery 1000 L').

1.12 Verification and Sealing Provision

Provision is made for a verification mark to be applied.

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

2. Description of Variant 1 approved on 5/08/05

The Liquip model EMH 500RP calculator/indicator which has a Liquip model ERP 100 remote pulse transmitter (Figure 5).

3. Description of Variant 2 approved on 5/08/05

The calculator/indicator incorporating a batch pre-set facility. It may also be fitted with output sockets for the connection of auxiliary and/or peripheral devices. If the calibration setting in Management mode is RemBAT?Y then the batch setting can also be set from the front panel. If a batch quantity is set then it will be displayed on the bottom display, otherwise the company name will be displayed.

4. Description of Variant 3 approved on 5/08/05

The calculator/indicator for use in fixed installations with a Liquip model UPS100-240 uninterruptible power supply battery back-up (Figure 6).

5. Description of Variant 4 approved on 5/08/05

The Liquip model EMH 500H-MP calculator/indicator with software version 01.05.02, 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.

5.1 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.

6. Description of Variant 5 approved on 24/02/09

The Liquip model EMH 500 IS calculator/indicator which is suitable for use in certain hazardous installations.

The model EMH 500 IS has the same features and functions as the pattern (model EMH 500H) as described in Technical Schedule No S351A except for the following:

Field of operation

Environmental temperature range for the calculator/ indicator and the pulse generator: –15°C to 55°C

Markings

Environmental class for the calculator/indicator: Class N

The calculator/indicator is approved with a Liquip model EJB200 power supply junction box (Figure 7) which is suitable for use in certain hazardous installations.

7. Description of Variant 6 approved on 10/03/09

With the Liquip model ERP 200 pulse transmitter (Figure 8) which has the same features and functions as the model ERP 100) as described in Technical Schedule No S351A. 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.

8. Description of Variant 7 approved on 12/09/16

The DreamTec model i-meter GPS tracking module (Figure 9) or similar models connects to the printer output of the EMH500 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

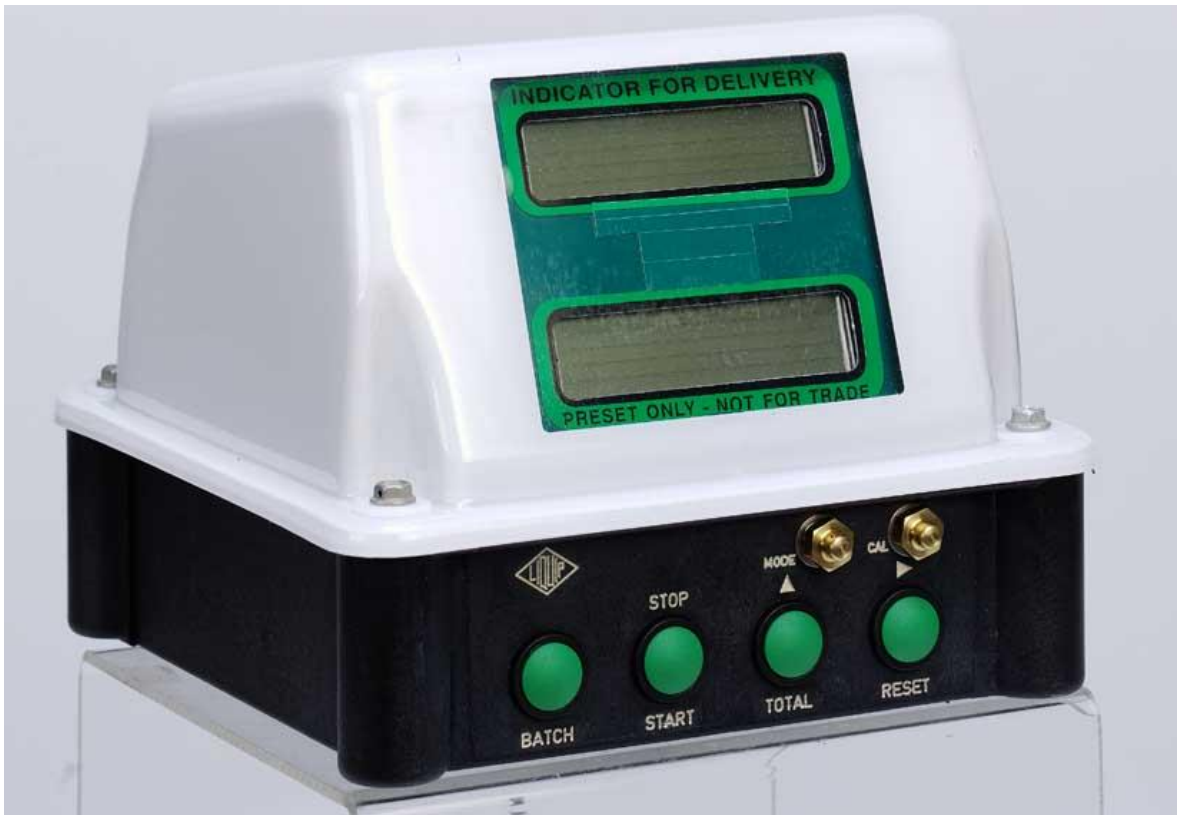
Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

Maximum Permissible Errors

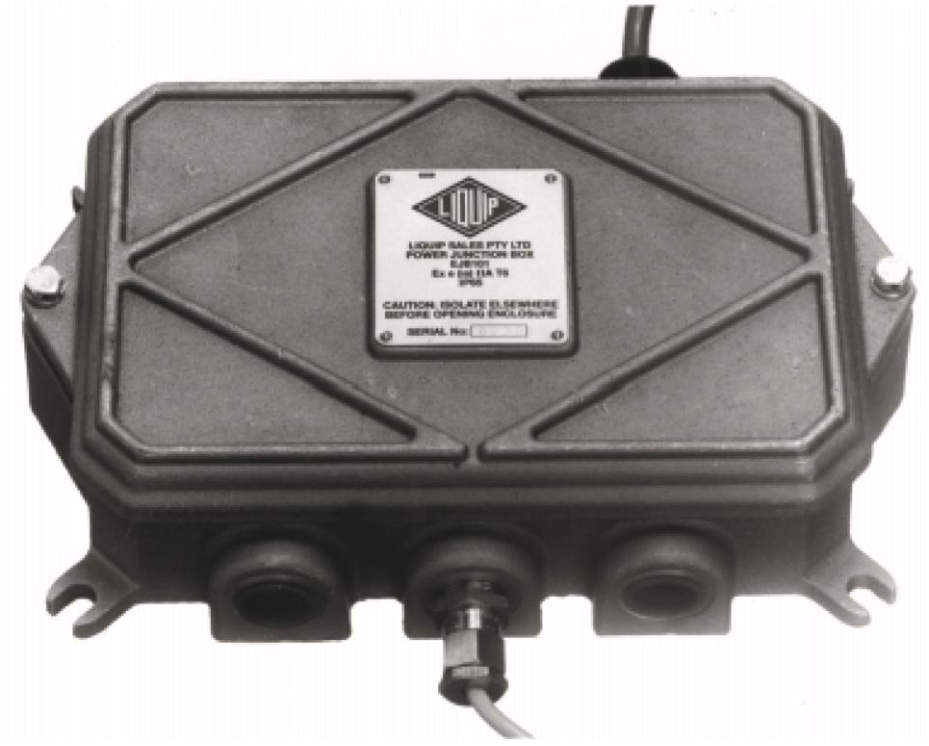
The maximum permissible errors are specified in the *National Trade Measurement Regulations 2009*.

FIGURE S351A – 1



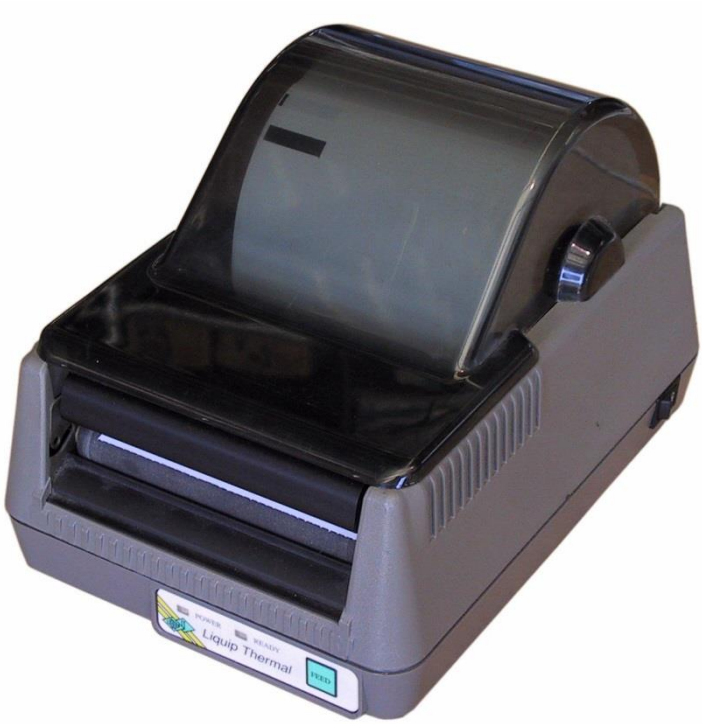
Liquip Model EMH 500H Calculator/Indicator (pattern)

FIGURE S351A – 2



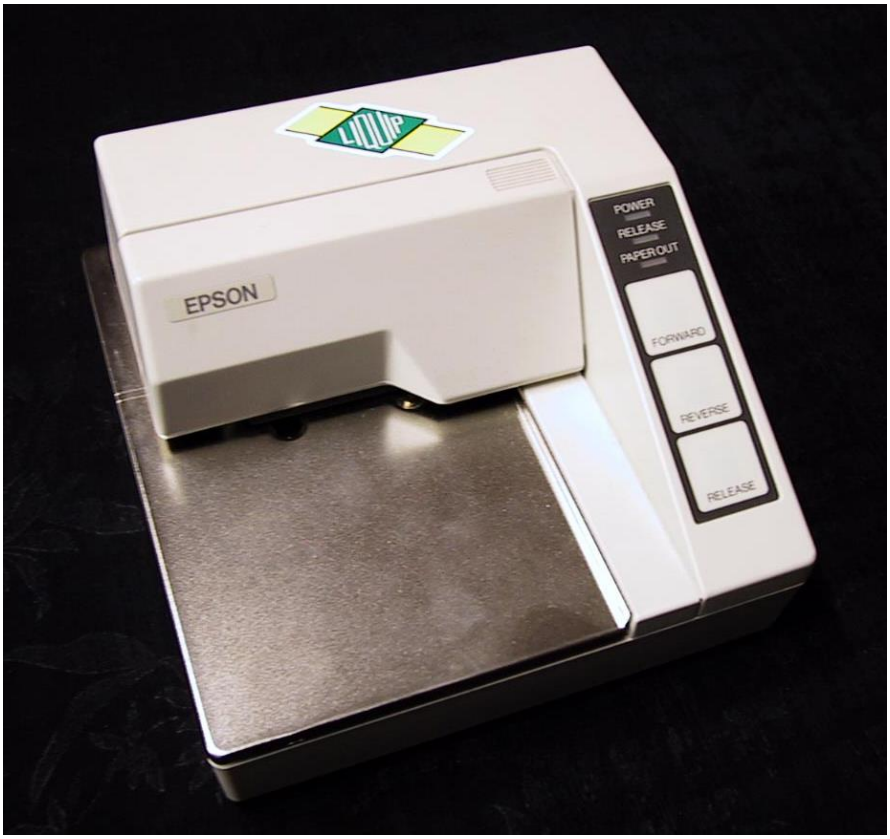
Liquip Model EJB101 Version 1.2 Junction Box

FIGURE S351A – 3



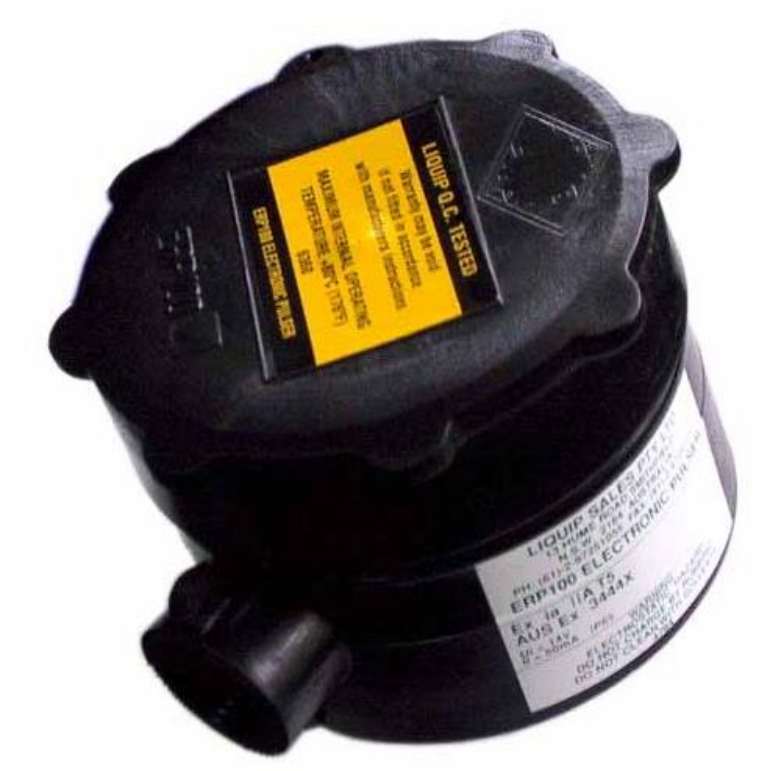
Liquip Touchstar Blaster Model BD422003-C17 Printer

FIGURE S351A – 4



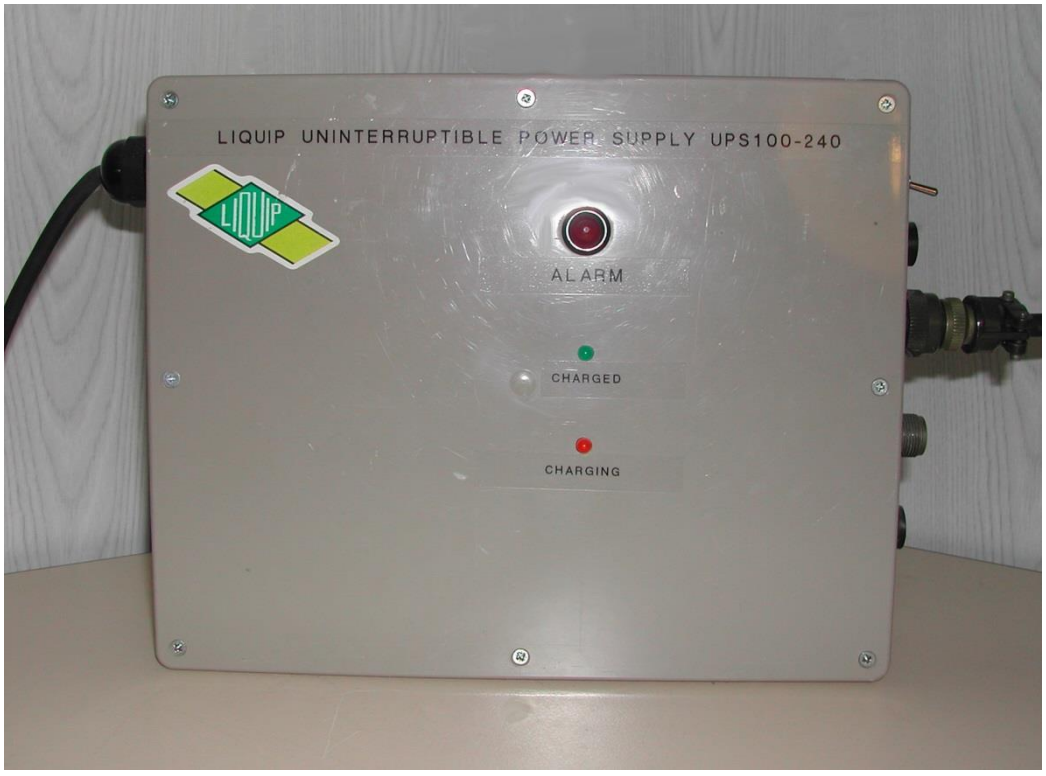
Epson Model TM-295 Printer

FIGURE S351A – 5



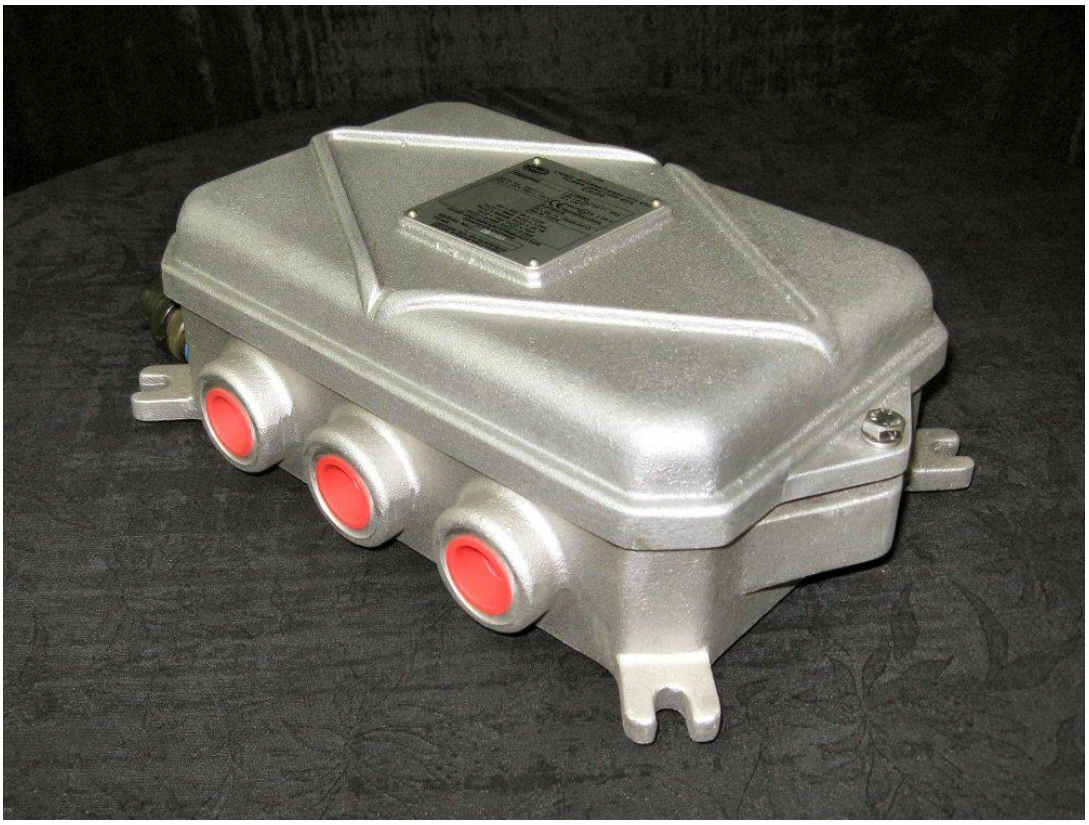
Liquip Model ERP 100 Remote Pulse Transmitter (variant 1)

FIGURE S351A – 6



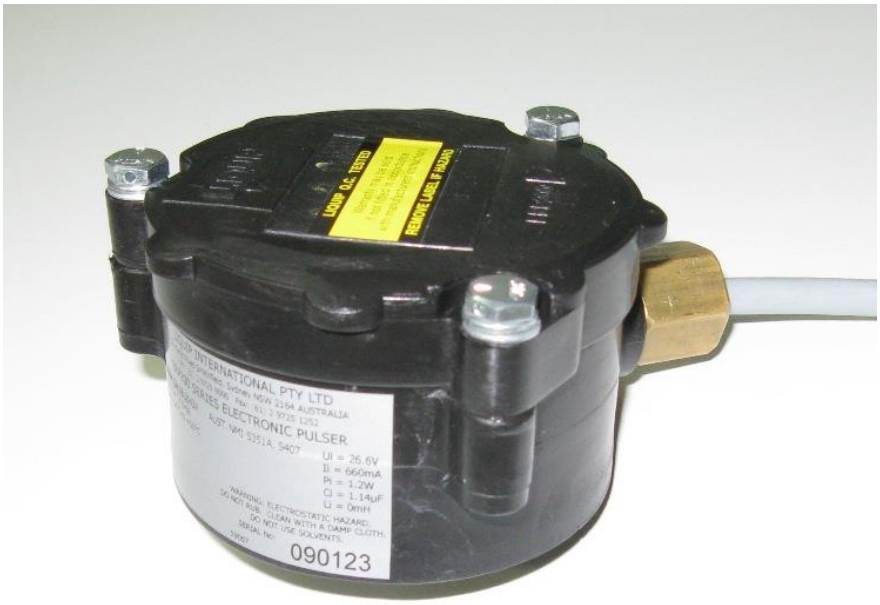
Liquip Model UPS100-240 Uninterruptible Power Supply (variant 3)

FIGURE S351A – 7



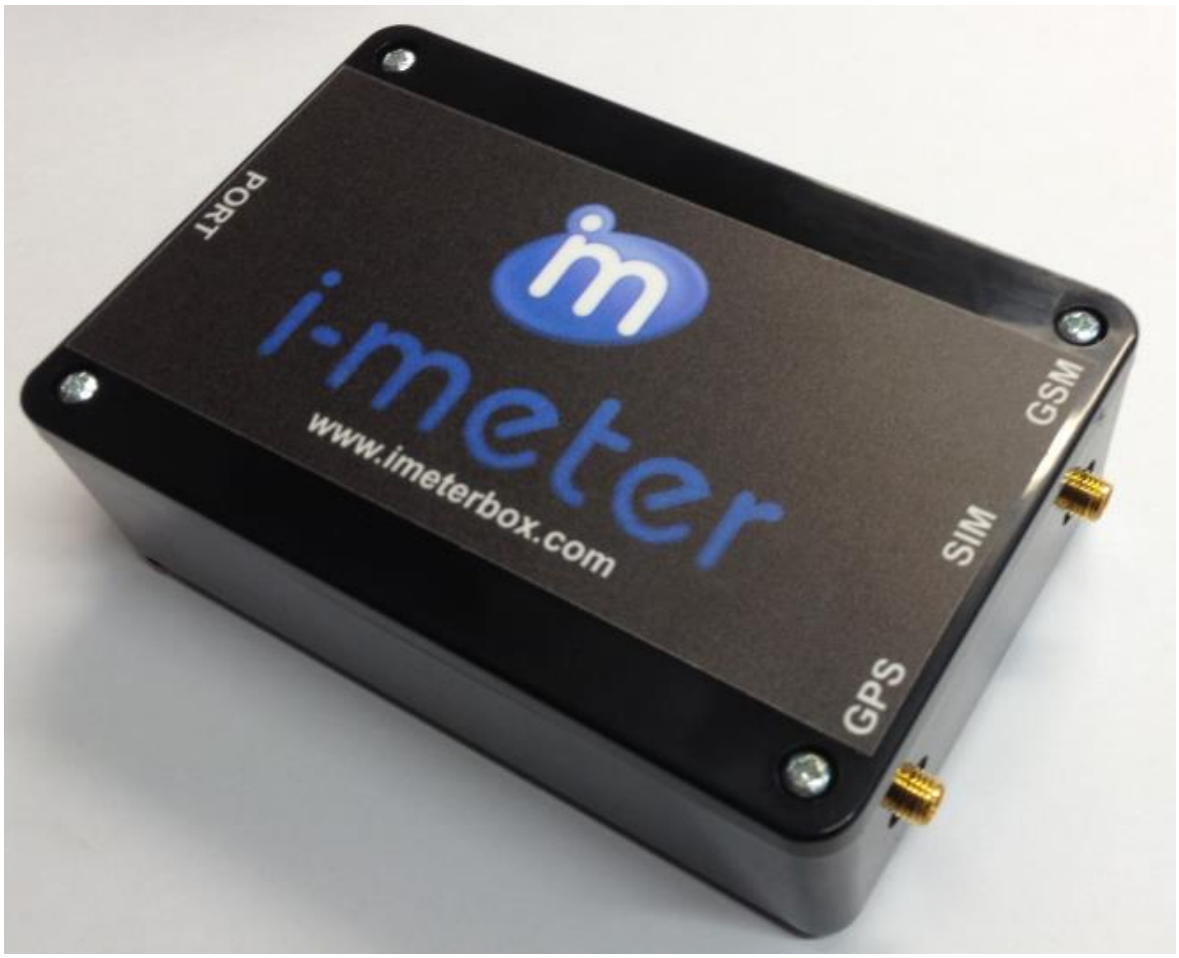
Liquip Model EJB200 Power Supply Junction Box (variant 5)

FIGURE S351A – 8



Liquip Model ERP 200 Pulse Transmitter (variant 6)

FIGURE S351A – 9



DreamTec Model i-meter GPS Tracking Module (variant 7)

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