



Australian Government
Department of Industry,
Innovation and Science

National Measurement Institute

Certificate of Approval NMI 10/2/3B

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.

Actaris Model Type 4D-MT Bulk LPG Flowmetering System

submitted by Hurl Nu-Way Pty Ltd
14 Aristoc Road
Glen Waverley VIC 3150

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 Measuring Systems for Liquids Other than Water, dated June 2011.

This approval becomes subject to review on **1/11/22**, and then every 5 years thereafter.

DOCUMENT HISTORY

| Rev | Reason/Details | Date |
|-----|--|----------|
| 0 | Pattern & variant 1 approved – certificate issued | 29/10/03 |
| 1 | Pattern & variant 1 reviewed – notification of change issued | 27/07/10 |
| 2 | Pattern & variant 1 reviewed & updated – certificate issued | 2/12/16 |
| | | |

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI (or NSC) 10/2/3B' and only by persons authorised by the submitter.

It is the submitter'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.

The values of the performance criteria (maximum number of scale intervals etc.) applicable to an instrument incorporating the pattern approved herein shall be within the limits specified herein and in any approval documentation for the other components.

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

A handwritten signature in black ink, appearing to read 'A Rawlinson', with a horizontal line underneath.

Dr A Rawlinson

TECHNICAL SCHEDULE No 10/2/3B

1. Description of Pattern **approved on 29/10/03**

An Actaris model Type 4D-MT 50 mm bulk LPG flowmetering system (Figures 1 and 2). The flowmeter may also be known as a Schlumberger or Neptune instrument of the same model..

1.1 Field of Operation

The field of operation of the bulk LPG measuring system is determined by the following characteristics:

- Minimum measured quantity (V_{min}) 50 L
- Minimum flow rate (Q_{min}) 38 (or 70) L/min (*)
- Maximum flow rate (Q_{max}) 450 L/min
- LPG density range (at 15°C) 507 to 585 kg/m³
- LPG temperature range -10°C to 50°C
- Maximum operating pressure 2400 kPa
- Minimum operating pressure maintained 100 kPa above the equilibrium vapour pressure
- Ambient temperature range -25°C to 55°C
- Accuracy class 1.0
- The system is approved as a non-interruptible measuring system (see clause **1.2 (vii) Transfer Device**).

(*) The lower value is approved only when the non-linearity correction facility of the calculator/indicator is in use.

1.2 Components of Measuring System

(i) Supply Tank

An above ground or below ground supply tank can be used provided the pump is in flooded suction. The tank may be fitted with an optional low liquid level detection device to prevent vapours entering the pump.

(ii) Pump

The pump and the pipework are installed to provide a flow rate of at least three times the minimum flow rate specified for the flowmeter. The pump is positioned as close as possible to the supply tank and for other than submersible turbine pumps, the outlet of the supply tank has a continuous fall to the pump and the pipe diameter is equal to or greater than the pump inlet.

A strainer may be fitted in the pipeline between the supply tank and the pump.

If the pump is not for the exclusive use of the flowmeter, the system is designed to ensure that the flow rate through each meter is maintained within the approved low rate range for all combinations of alternative uses of the pump.

(iii) Gas Elimination Device (Figures 2 and 3)

The meter is protected from measurement of vapour by an Actaris 50 mm float-operated gas purger with integral strainer. The gas purger is fitted immediately upstream of the meter and any accumulated vapour in the gas purger is vented through a non-return valve connected to a vapour return line of not less than 20 mm in diameter, which in turn is connected to the vapour space of the supply tank.

A thermometer well is provided in the gas purger. Also, a temperature probe is fitted to the gas purger for the temperature conversion device in the calculator/indicator.

(iv) Measurement Transducer (Figures 2 and 3)

The measurement transducer is an Actaris model Type 4D-MT 50 mm positive displacement LPG flowmeter comprising a measuring chamber with an oscillating piston, and a gear train driving a meter shaft that rotates proportional to the volume throughput. The output shaft is connected to a compatible NMI- approved pulse generator and calculator/indicator. A 9.93 reduction gear train is required for when a Liquip model EMH 600 calculator/indicator is used. The flowmeter may also be known as a Schlumberger or Neptune instrument of the same model.

The meter is approved for maximum and minimum flow rates of 450 L/min and 70 L/min respectively without non-linearity correction and with a minimum flow rate of 38 L/min when utilising the non-linearity facility of the calculator/indicator.

Calibration adjustment of the meter is achieved electronically via the calculator/indicator.

For verification/certification, provision is made to connect a pressure gauge at the meter or upstream of the pressure differential valve.

A non-return valve is fitted upstream of the meter to prevent reverse flow.

(v) Pulse Generator

A Liquip Sales model EPR 100 pulse generator, or an Acme model EPU 200 pulse generator (Figure 4) as described in the documentation of NSC approval No S189B, or any other compatible NMI- approved pulse generator may be fitted to the meter output shaft to provide the pulse output to the calculator/indicator.

(vi) Calculator/Indicator

A Liquip model EMH 600 calculator/indicator (Figure 5) incorporating a non-linearity correction facility is interfaced to a printer as described in the documentation of NSC approval No S407. Alternatively, an Acme model 6000 calculator/indicator (Figure 6) as described in the documentation of NSC approval No S170B or any other compatible NMI- approved calculator/indicator for liquefied petroleum gas may be used.

The indicator is configured so that the volume is displayed at least in 0.1 litre increments.

(vii) Pressure Differential Valve (Figures 2 and 3)

The Actaris 50 mm spring-loaded diaphragm valve is designed to maintain the pressure at the meter at least 100 kPa above the vapour pressure to prevent the formation of vapour. The low-pressure side of the device is connected to the vapour space of the supply tank either directly or via the vapour return line for the gas elimination device.

(viii) Transfer Device

The transfer device is fitted downstream of the pressure differential valve, and is in the form of a shut-off valve (e.g. an on/off valve or a nozzle without flow-adjustment capability) used to define the start and stop of measurement.

The bulk LPG metering system is considered a non-interruptible system where the valve/nozzle is latched in the open position for the duration of the delivery.

1.3 Descriptive Markings

Each measuring system shall bear the following information, placed together on the meter:

- Manufacturer's name or mark ...
- Model designation ...
- Serial number ...
- Pattern approval mark NMI (or NSC) 10/2/3B
- Minimum flow rate ...
- Maximum flow rate ...
- Liquid temperature range -10°C to 50°C
- Density range at 15°C 507 to 585 kg/m³
- Environmental class Class C
- Accuracy class 1.0
- Maximum operating pressure ... kPa
- Minimum operating pressure (at least 100 kPa above vapour pressure)

In addition, the indicator is marked with the minimum delivery (V_{min}) specified for the metering system (e.g. "Minimum delivery 50 L".)

1.4 Verification Provision

Provision is made for the application of a verification/certification mark.

1.5 Sealing Provision

Provision is made for sealing the calibration adjustment in the calculator/indicator using the method described in its NMI approval documentation

2. Description of Variant 1

approved on 29/10/03

Using certain other ActarisType 4D-MT series LPG meters as listed in Table 1 (refer to Figures 7 and 8). The flowmeters may also be known as Schlumberger or Neptune instruments of the same model.

TABLE 1

| Meter Size | Flow Rate Range (L/min) | | Minimum Measured Quantity (L) |
|------------|-------------------------|-----------|-------------------------------|
| | Q_{min} | Q_{max} | |
| 38 mm | 22 (or 45) (*) | 227 | 50 |
| 32 mm | 18 | 114 | 20 |

(*) The lower value is approved only when the non-linearity correction facility of the calculator/indicator is in use.

TEST PROCEDURE

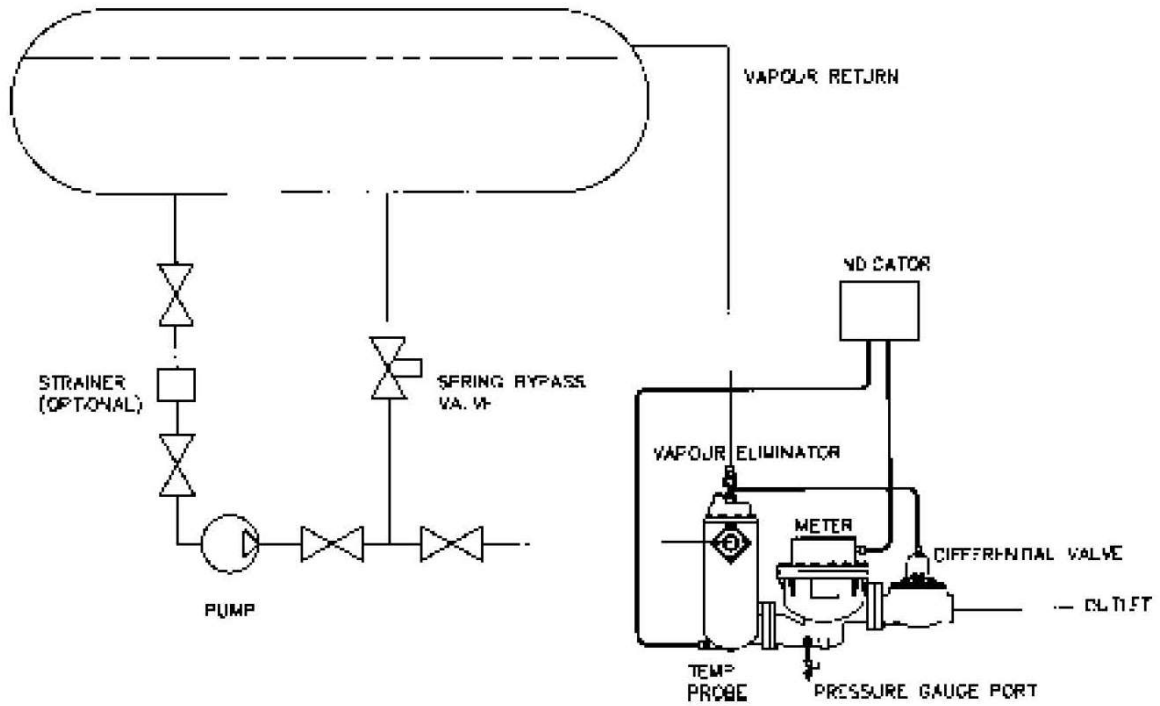
Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

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

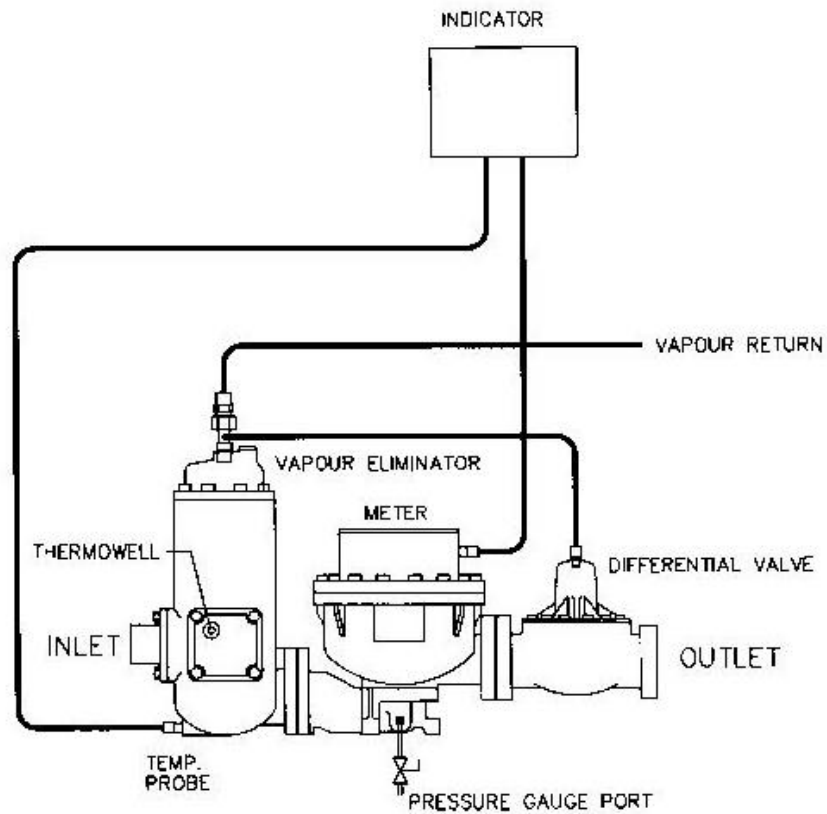
The maximum permissible errors are specified in the *National Trade Measurement Regulations 2009*.

FIGURE 10/2/3B – 1



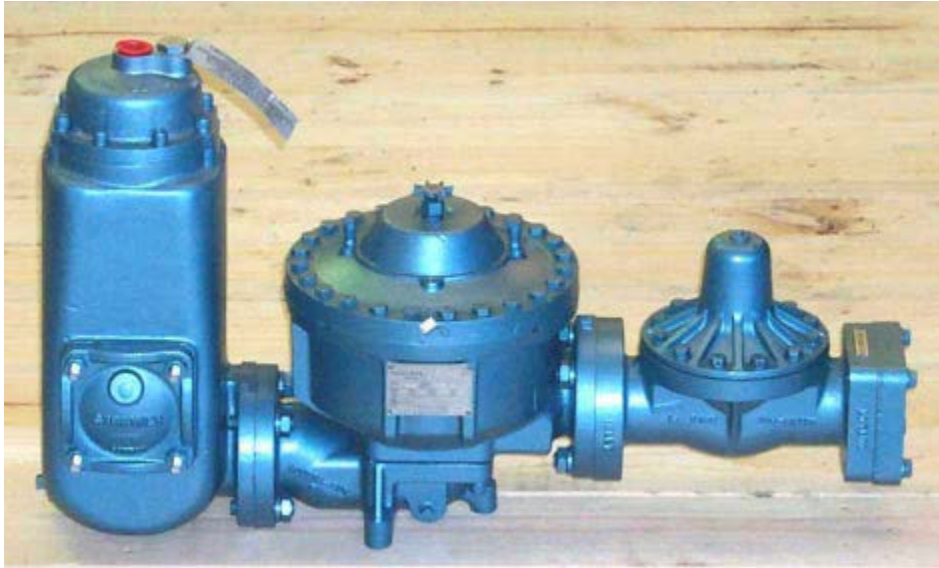
Typical Actaris LPG Flowmetering System

FIGURE 10/2/3B – 2



Details of Typical Actaris LPG Flowmetering System
With 50 mm LPG Meter

FIGURE 10/2/3B – 3



Actaris Type 4D-MT 50 mm LPG Meter
With Gas Purger and Pressure Differential Valve

FIGURE 10/2/3B – 4



Acme Model EPU 200 Pulse Generator

FIGURE 10/2/3B – 5



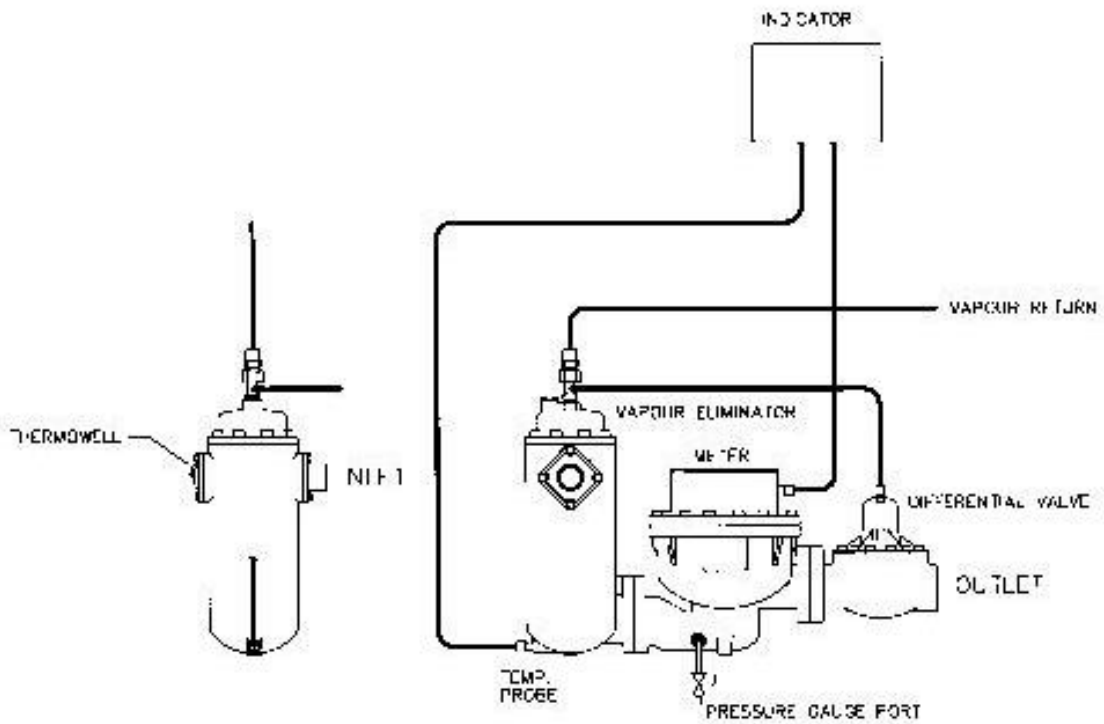
Liquip Model EMH 600 Calculator/Indicator

FIGURE 10/2/3B – 6



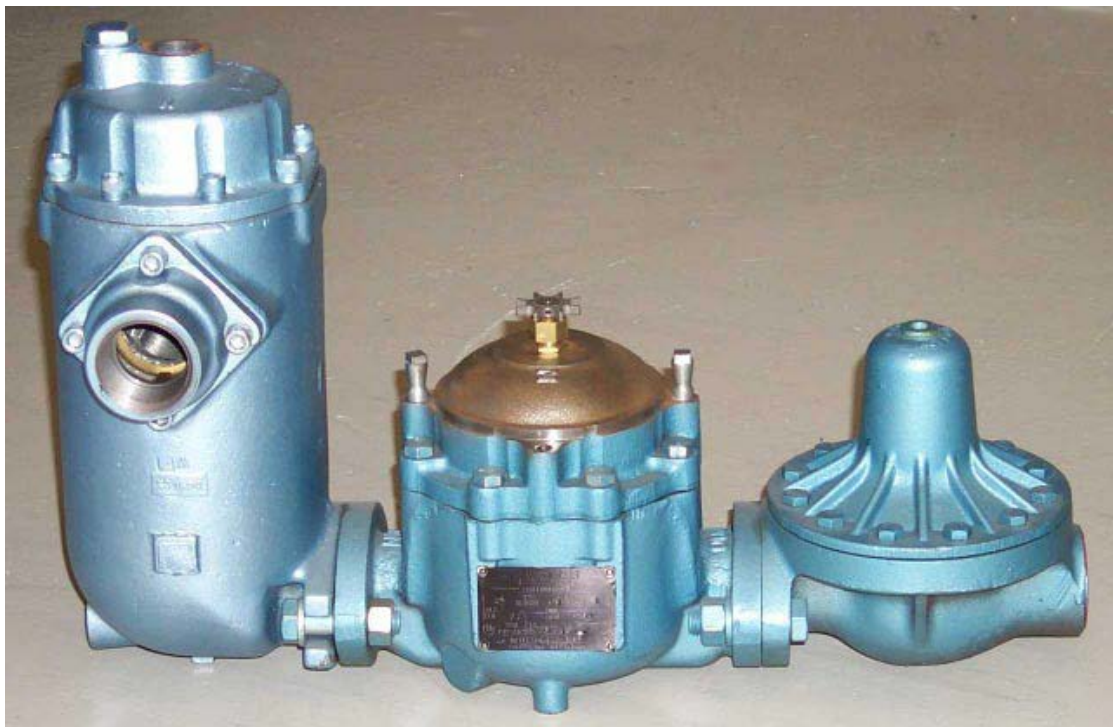
Acme Model 6000 Calculator/Indicator

FIGURE 10/2/3B – 7



Details of Typical Actaris LPG Flowmetering System
With 32 or 38 mm LPG Meter

FIGURE 10/2/3B – 8



Actaris Type 4D-MT 38 mm LPG Meter
Gas Purger and Pressure Differential Valve