



Australian Government
**Department of Industry, Science,
Energy and Resources**

**National
Measurement
Institute**

36 Bradfield Road, West Lindfield NSW 2070

**Certificate of Approval
NMI 10/2/19**

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.

Turbines Inc. Model HA0150 Bulk LPG Flowmetering System

submitted by Liquip International Pty Ltd
 148B Newton Road
 Wetherill Park 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, July 2011.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 approved – interim certificate issued	24/03/16
1	Pattern & variant 1 approved – certificate issued	7/07/16
2	Amend address – certificate issued	25/11/20

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 10/2/19' 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 Certificate 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*.



Darryl Hines
Manager
Policy and Regulatory Services

TECHNICAL SCHEDULE No 10/2/19

1. Description of Pattern **approved on 24/03/16**

A Turbines Inc. model HA0150 32 mm bulk LPG flowmetering system (Figure 1).

1.1 Field of Operation

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

- Minimum measured quantity, V_{min} 50 L
- Maximum flow rate, Q_{max} 710 L/min
- Minimum flow rate, Q_{min} 30 L/min
- Maximum pressure of the liquid, P_{max} 1000 kPa
- LPG density range (at 15°C) 505 to 580 kg/m³ (#)
- LPG liquid temperature range -10°C to 50°C
- Ambient temperature range -25°C to 55°C
- Accuracy class Class 1.0
- Maximum operating pressure (P_{max}) 1900 kPa
- Minimum operating pressure (P_{min}) at least 100 kPa above vapour pressure

The system is approved for vehicle-mounted installations as an interruptible measuring system (see clause **1.2 (ix) Transfer Device**).

- (#) Within the density range specified, the calculator/indicator is required to be manually set for the density of LPG being metered.

1.2 Components of Measuring System

(i) Supply Tank

The supply tank has a bottom outlet larger than the pump outlet and has at least one return line fitted to the vapour space of the tank. A return line is required for the gas elimination device and for verification of the metering system.

(ii) Pump

Either a positive displacement or centrifugal pump, with integral or external pump bypass valve, is positioned as close as possible to the outlet of the supply tank. The pipe from the supply tank has a continuous fall to the pump inlet and has a diameter not smaller than that of the pump outlet pipe.

(iii) Vapour Elimination Device

Either a Neptune model 4D-MT (or Liqua Tech model VE2) 2" gas extractor (Figure 2a) or a Liquid Controls model MA8310 float-operated gas extractor (Figure 2b) or any other equivalent (*) device is connected upstream of the meter.

The gas extractor incorporates a strainer to protect the meter. A non-return valve can be separate to prevent reverse flow.

- (*) '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.

(iv) Temperature Transducer

A Liquip part number 4155, PT100 3-wire (plus shield) RTD probe is fitted to the gas extractor which also has a thermometer well for verifying the measured temperature of LPG, or any other compatible (#) temperature probe with similar characteristics.

(v) Measurement Transducer

The measurement transducer is a Turbines Inc. model HA0150 32 mm turbine flowmeter (Figure 3) incorporating dual signal pick-off with pre-amplifier.

No flow straighteners or straight pipes are required before or after the turbine meter.

(vi) Differential Pressure Valve

A Neptune model 4D-MT (or Liqua Tech model VE2) 2" differential pressure valve (Figure 2a) or a Liquid Controls model A 2843 differential pressure valve (Figure 2b) or to any other equivalent device (*) is installed downstream of the meter to maintain the LPG in liquid phase and allow flow when the pressure of LPG at the meter is at least 100 kPa above its vapour pressure. The vapour side of the pressure differential valve is connected to the vapour space of the supply tank via the vapour return line.

Provision is made for a pressure gauge to be fitted between the differential pressure valve and the meter.

(vii) Calculator/Indicator

A Liquip DFV100 series (Figure 4) calculator/indicator (as described in the documentation of approval NMI S609) is used, or any other NMI-approved Liquip International calculator/indicator that incorporates electronic volume conversion for temperature facility to indicate the delivered volume of LPG at 15°C. The density of LPG is manually entered into the calculator/indicator. The meter non-linearity correction facility may be enabled to reduce the meter error as a function of flowrate.

Note: A DPI100 unit is not required when the above-mentioned calculator/indicator is interfaced with Turbines Inc. flowmeters.

(viii) Printer

A Touchstar Blaster model BD422003-C17 printer (Figure 5a) or an Epson model TM-295 printer (Figure 5b) or any other equivalent (*) printer is required to be interfaced to the calculator/indicator for systems with the temperature compensation facility enabled for indicating the delivered volume at 15°C and where the density is operator selectable.

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

(ix) Transfer Device

The transfer point that defines the start and stop of measurement is either a valve or an LPG nozzle fitted to a pipe/hose connected to the outlet of the differential pressure valve with no intermediate connections that may divert the delivery (Figure 1). However, two delivery outlets may be installed provided an isolation valve is fitted before each delivery outlet (Figure 7) and that one or more notices are fitted near each isolation valve/delivery outlet indicating that only one outlet is to be in use at any one time.

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; in addition, an operator monitors the entire delivery process and responds to any alarms given by the metering system.

(x) 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 displayed figure 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 DFV100 series calculator/indicator checks for the presence and correct operation of the printer.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Sealing Provision

The calculator/indicator has provision for sealing access to the calibration parameters as shown in Figure 6.

1.5 Descriptive Markings and Notices

Instruments are marked with the following data, placed together either on the indicating device or on a data plate or some information on either, in the form shown at right:

Manufacturer's mark, or name written in full	
Meter model	
Serial number	
NSC approval number		NMI 10/2/19
Year of manufacture	
Minimum flow rate		30 L/min
Maximum flow rate		710 L/min
Density range at 15°C		505 to 580 kg/m ³
Environmental classes		Class C, I (#)
Accuracy class		1.0
Maximum operating pressure	 kPa
Minimum operating pressure		at least 100 kPa above vapour pressure

In addition, the system is marked with the minimum delivery (V_{min}) specified for the metering system.

(#) Both these classes represent the same ambient temperature range of -25°C to 55°C but class I is for mobile systems.

Instruments fitted with more than one delivery outlet must have one or more notices fitted near each isolation valve/delivery outlet indicating that only one outlet is to be in use at any one time.

2. Description of Variant 1

approved on 24/03/16

With certain other models of Turbines Inc. HA series of flowmeters having metering capacities as listed in Table 1 below:

TABLE 1

Meter Model	Minimum Flow Rate, Q_{min} , L/min	Maximum Flow Rate, Q_{max} , L/min	Minimum Delivery, V_{min} , L
HA0100	15	510	20
HA0150	30	710	50
HA0200	50	900	100

The specifications for the meter of the pattern are in **bold** type.

TEST PROCEDURE No 10/2/19

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

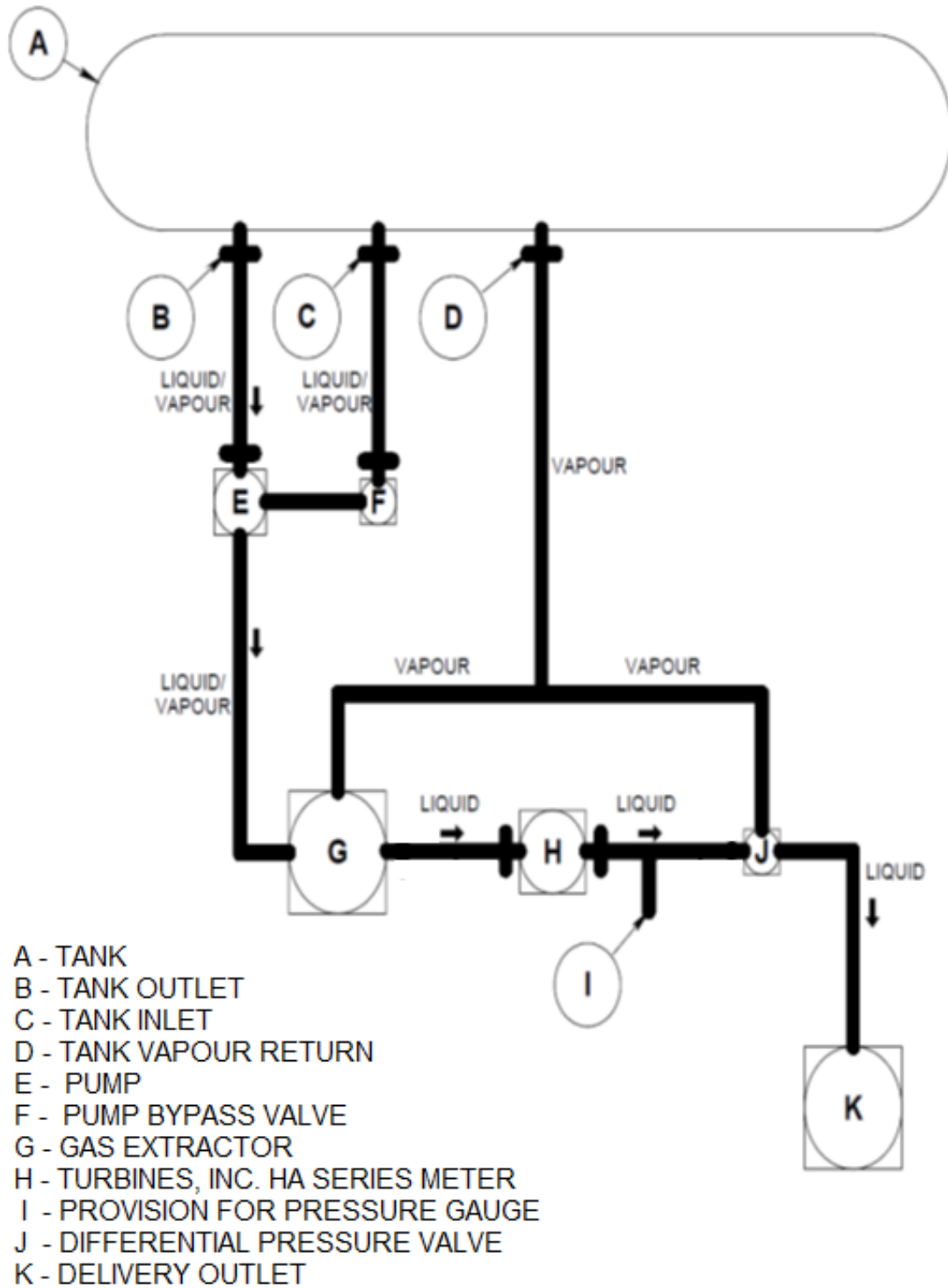
The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

The tests should be conducted in conjunction with any test specified in the approval documentation for any devices used with this metering system.

Maximum Permissible Errors

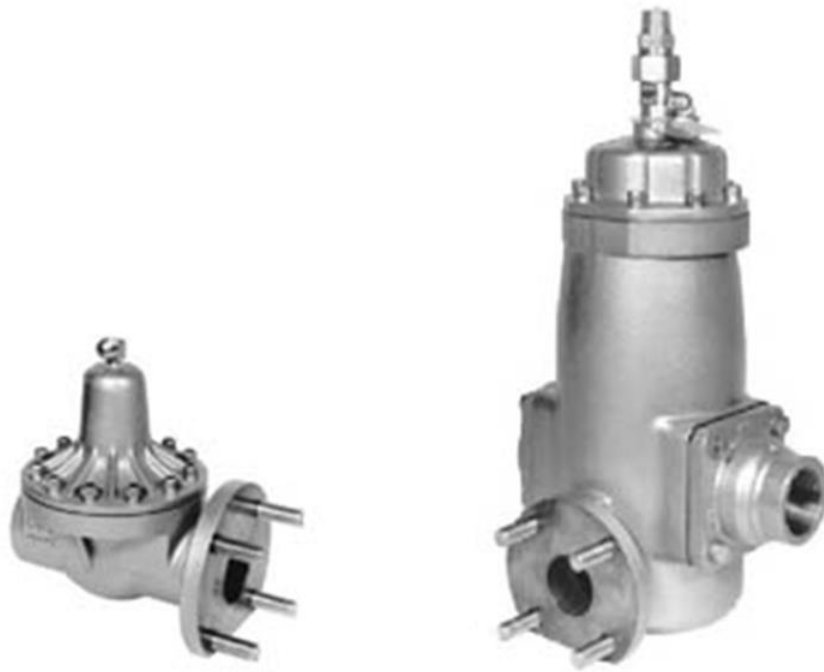
The maximum permissible errors are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

FIGURE 10/2/19 – 1



Typical Turbines Inc. HA Series Bulk LPG Flowmetering System

FIGURE 10/2/19 – 2



(a) Neptune/Liqua Tech Gas Extractor and Neptune/Liqua Tech Differential Pressure Valve



(b) Liquid Controls Model MA8310 Gas Extractor and Liquid Controls Model A 2843 Differential Pressure Valve

FIGURE 10/2/19 – 3



Turbines Inc. Model HA0150 Turbine Flowmeter

FIGURE 10/2/19 – 4



Liquip Model DFV100 Series Calculator/Indicator for Liquid-measuring Systems

FIGURE 10/2/19 – 5



(a) Blaster Model BD422003-C17 Printer



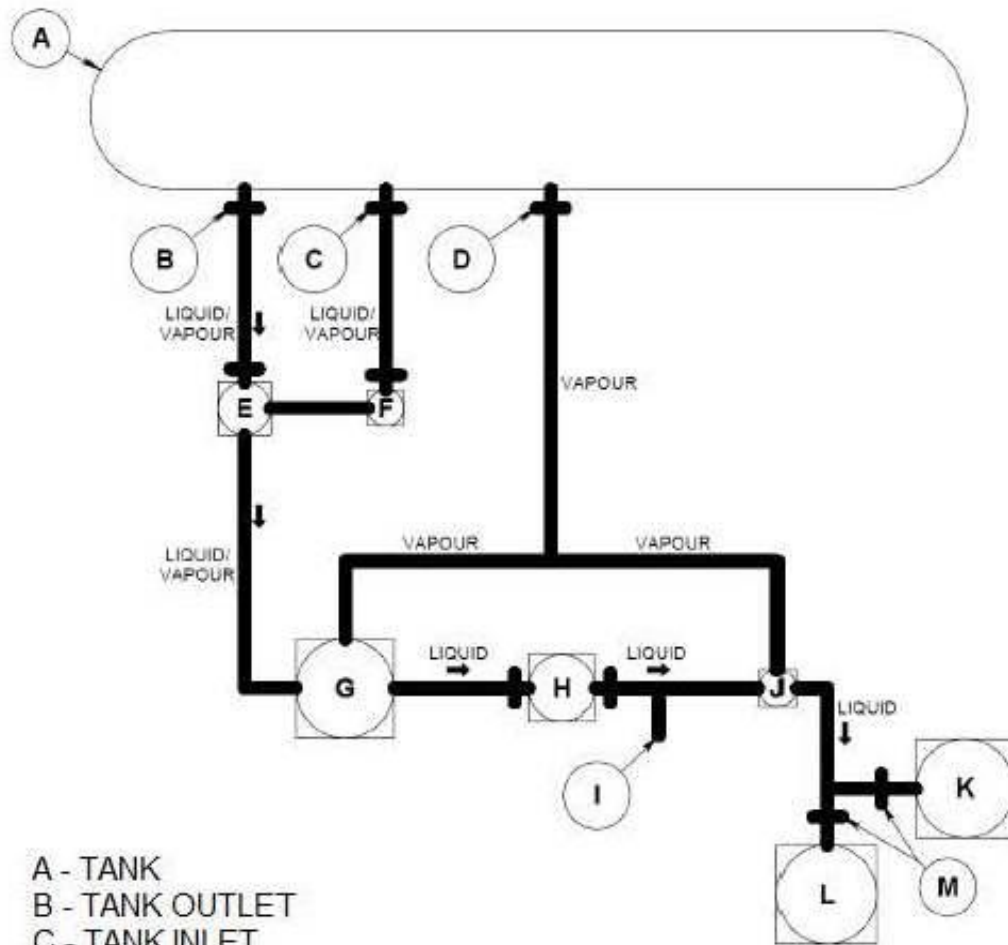
(b) Epson Model TM-295 Printer

FIGURE 10/2/19 – 6



Typical Sealing of the CAL Button to a cover-mounting screw (not shown)

FIGURE 10/2/19 – 7



- A - TANK
- B - TANK OUTLET
- C - TANK INLET
- D - TANK VAPOUR
- E - PUMP
- F - PUMP BYPASS VALVE
- G - GAS EXTRACTOR
- H - TURBINES, INC. HA SERIES METER
- I - PROVISION FOR PRESSURE GAUGE
- J - DIFFERENTIAL PRESSURE VALVE
- K - DELIVERY OUTLET
- L - ALTERNATIVE DELIVERY OUTLET
- M - ISOLATION VALVES

Typical Turbines Inc. HA Series Bulk LPG Flowmetering System
With Alternative Outlets

~ End of Document ~