



Australian Government
Department of Industry and Science

National Measurement Institute

Certificate of Approval

NMI 10/1/25

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.

Gilbarco Model T921A1ND SK700-2 LPG Fuel Dispenser for Motor Vehicles

submitted by Gilbarco Australia Limited
 20 Highgate Street
 AUBURN NSW 2144

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 1/12/20, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 & 2 approved – certificate issued	26/11/10
1	Pattern amended (Field of Operation & Test Procedure) – notification of change issued	13/10/11
2	Pattern & variants 1 & 2 updated & amended (software version & Test Procedure) – certificate issued	20/02/13
3	Pattern & variants 1 & 2 reviewed & amended (minimum density) – certificate issued	05/03/17
4	Pattern & variant 3 approved – certificate issued	05/03/17

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with approval number 'NMI 10/1/25' 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.

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

Signed

Stephen Horrocks

TECHNICAL SCHEDULE No 10/1/25

1. Description of Pattern **approved on 26/11/10**

A Gilbarco model T921A1ND SK700-2 (Figures 1a and 2) is a fuel dispenser for refuelling motor vehicles using liquefied petroleum gas (LPG). The dispenser is approved for use in attendant-operated mode, or in attended self-service mode using any compatible (#) approved control console.

(#) '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 measuring system is determined by the following characteristics:

- o Minimum measured quantity, V_{min} 2 L
- o Maximum flow rate, Q_{max} 40 L/min
- o Minimum flow rate, Q_{min} 8 L/min
- o Maximum pressure of the liquid, P_{max} 2450 kPa
- o LPG density detection range (at 15°C) 500 kg/m³ to 570 kg/m³
- o Ambient temperature range -10 to 55°C
- o Volume conversion to 15°C over a liquid temperature range of -5°C to 45°C
- o Operating pressure is maintained at least 200 kPa above the equilibrium vapour pressure of LPG.
- o Accuracy class 1.0

1.2 Description of the Metering System

- A Batchen model Mk-V constant bleed vapour elimination device.
 - A Batchen model Mk VI spring-loaded pressure differential valve.
 - A Batchen model MkIII two-piston liquefied petroleum gas (LPG) flowmeter fitted with a Gilbarco model 510 pulse generator for LPG.
 - With an optional magnetic coupling between the meter and the pulse generator.
 - A Gilbarco model Sandpiper 2 (aka model E101) calculator/indicator configured for use with a density detection device enabling the volume conversion to 15°C for LPG.
 - With an optional pre-setting device.
 - A Gasguard model LGI LPG or any other NMI-approved LPG nozzle (*).
- (*) Note that the submitter must be consulted regarding the acceptability of any alternative nozzles.

A compatible NMI-approved control system may also be connected to provide self-service operation.

1.3 System Description for LPG (Figure 2)

- (i) The supply tank may be located above or below ground depending on the type of pump used.
- (ii) The pump may be positioned above the supply tank, in which case the pump shall be a multi-stage regenerative turbine LPG pump specially designed for use in **suction lift** installations. Alternatively, the pump shall be positioned below the supply tank or a submersible (turbine) pump may be located within the supply tank so that it is always in a state of flooded suction (**suction head** installations). There shall be no restrictive fittings within ten pipe diameters of the pump inlet.

The inlet pipe to the pump is larger than the outlet pipe from the pump. The external pump by-pass relief valve is installed in a line returning to the vapour space of the supply tank.

A pump supplying LPG to several flowmeters shall be of sufficient capacity rating to ensure that when all flowmeters are in use the flow rate through each flowmeter is greater than Q_{min} .

- (iii) The flowmeter is protected from the measurement of vapour by a Batchen model Mk-V vapour eliminator (Figure 3a) and an LPG Measurement model DSSG98 LPG or model DSSG-2000 monitoring device.

The gas elimination device allows a continuous bleeding of LPG and any vapour back to the vapour space of the supply tank, via a vapour return line of not less than 20 mm in diameter.

In addition, a vapour detection sensor is incorporated which activates the flow control valve to stop the measurement when an excessive amount of vapour is detected.

The gas elimination device also has provision for inserting a reference thermometer for verification of LPG temperature measurement.

- (iv) The measurement transducer is a Batchen model Mk III two piston positive displacement LPG flowmeter (Figure 3b) fitted with a Gilbarco model Encore 510 dual channel pulse generator. The shaft of the meter and the pulse generator rotate twice for a throughput of one litre. The pulse generator incorporates gears to produce, in conjunction with the software of the calculator/indicator, a pulse output of 250 pulses/litre. The outlet of the meter is connected to a flow control valve with an optional pre-set valve. The flowmeter is suitable for use over a flow rate range of 8 to 50 L/min, but the dispenser is only approved for use up to a maximum of 40 L/min.
- (vii) The transfer device is a Gasguard model LGI LPG nozzle, or any other compatible NMI-approved LPG nozzle (*) that cannot be placed in a hung-up position other than to end the delivery. The nozzle is connected to a DAYCO model 7132 CGA hose, or any other compatible hose complying with the relevant standards for LPG. A breakaway coupling and an excess flow valve may be fitted to the hose.
- (*) Note that the submitter must be consulted regarding the acceptability of any alternative nozzles.
- (viii) A non-resettable electro-mechanical volume totaliser is provided for each hose or each grade. The totaliser indicates the accumulative volume at 15°C dispensed by the instrument. The totaliser is located adjacent to the Management Interface Unit.

1.4 Calculator/Indicator

A Gilbarco model Sandpiper 2 calculator/indicator (also known as the model E101 – Figure 4) which has a single display for indicating volume and another for price. There is also a unit price display for each hose (Figure 1); an emergency stop may be provided in the vicinity of the indicating head. The instrument is approved with versions 25xxx, 27xxx or 29xxx (*) software, which can be viewed by at power up or by forcing a restart by pushing the F1 then the F2 buttons on the Managers' keypad.

The display limits and increments are:

Price	9999, 99 in 0.01 \$ increments
Volume	9999, 99 in 0.01 L increments
Unit price	999, 9 in 0.1 ¢/L increments
Totaliser	9999999 L

A pre-set device may also be fitted to allow pre-set to be selected by means of volume (litres) or price (dollars).

During pressurisation the instrument suppresses the display for the first 100 mL of the delivery.

The calculator/indicator also incorporates a checking facility for the meter pulse output, density/temperature measurement and vapour detection devices.

A non-resettable electro-mechanical volume totaliser is provided for each hose or each grade.

1.5 Volume Conversion for Density and Temperature Device for LPG

The volume conversion for density and temperature function is performed by the calculator indicator in conjunction with the LPG Measurement model DSSG98 LPG or model DSSG-2000 monitoring device. The device comprises a probe located in the vapour eliminator interfaced to an integrated circuit board located in a separate unit. The probe senses LPG density, measures the temperature of the LPG, and detects if any vapour is present. The monitoring device incorporates the ASTM-IP-API *Petroleum Measurement Tables for Light Hydrocarbon Liquids*, metric edition, Table 54 and Table 53 for volume conversion within the approved field of operation.

1.6 Operation and Checking Facilities

Removing the nozzle from its receptacle starts the operating cycle of the instrument. The reset cycle clears the display of any previous sale and starts the pump. The instrument will automatically check for meter pulse output and for correct parameter settings. A segment check is also performed and when completed the unit price is displayed and the price and volume displays are reset to zero. At the end of this cycle, the solenoid valve opens and the delivery can start. Replacing the nozzle to its normal hang up position closes the solenoid valve and the delivery is terminated. The details of the delivery are displayed by the instrument until the next reset cycle.

The calculator monitors the presence and correct transmission of signal from the measurement transducer, and in the event of detecting a fault the instrument indicates an error code and has provision for controlling electrically-operated valves to stop the delivery.

1.7 Verification Provision

Provision is made for the application of a verification mark.

1.8 Sealing Provision

Provision is made for sealing the mechanical calibration device of the meters.

The meter has provision for sealing as shown in Figure 3.

Access to the electronic meter calibration button and the integrated electronics have provision for sealing (Figure 5).

1.9 Descriptive Markings and Notices

- (a) Instruments are marked with the following data, together in one location on a data plate:

Pattern approval sign	NMI 10/1/25
Manufacturer's identification mark or trade mark
Manufacturer's designation (model number)
Serial number
Year of manufacture
Environmental class	class N
Maximum flow rate (Q_{max}) L/min
Minimum flow rate (Q_{min}) L/min
Maximum operating pressure (P_{max})	2450 kPa
Approved for LPG density range	500 kg/m ³ to 570 kg/m ³ (at 15°C)
Maximum liquid temperature (T_{max})	45°C
Minimum liquid temperature (T_{min})	-5°C
Accuracy class	class 1.0

- (b) The minimum measured quantity (V_{min}) shall be clearly visible on any indicating device visible to the user during measurement, in the form 'Minimum delivery 2 L'.

2. Description of Variant 1 approved on 26/11/10

Certain other models and configurations of the T92... SK700-2 series, namely:

- The model T922A*ND SK700-2 LPG fuel dispenser with 'lane oriented hose(s)' having hose retraction (Figure 1b),
- The model T926A*ND SK700-2 LPG fuel dispenser with 'lane oriented hose(s)' without hose retraction,

Where '*' in the model number represents the number of hoses/nozzles.

3. Description of Variant 2 approved on 26/11/10

With a 'dead man' switch fitted to the LPG dispenser.

The 'dead man' switch controls the opening of the flow control valve during filling.

When this switch is fitted, the solenoid valve will open at the end of the reset cycle (as described in testing procedure for commencement of a delivery) and then the 'dead man' switch is held closed to allow a delivery to proceed. Releasing the switch will stop the delivery.

3. Description of Variant 2

approved on 05/03/17

For use with Apollo Calculator/indicator

TEST PROCEDURE No 10/1/25

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

Tests should be conducted in conjunction with any tests specified in the approval documentation for any components used, including indicator/controller and submersible turbine pump (STP) hydraulic systems.

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 Schedule 1 of the *National Trade Measurement Regulations 2009*.

Tests

For LPG

To display the temperature, density and volume at operating conditions, via the Manager's keypad:

1. Push F1.
2. Push digits 2, 2, 2, 2, then ENTER (*).
3. Push 3, and then ENTER.
4. Push 1, then ENTER for uncompensated Volume (or 2 for compensated).
5. Push digit to select required LPG meter, then ENTER.

Note: Push 'Clear' if different selection required before pushing ENTER.

Refer Figure 13 for meter position and required selection digits.
e.g. For meter A select 1, for meter E select 5.

Push F1, to prompt to select alternative meters or volume options.

Push F2, to reboot and exit.

(*) '2222' is default access code for level 1 programming; if code has been changed, check with site manager for current access code.

Display format of 'W & M' (trade measurement) data:

PPU			T	T	t	LPG grade PPU = Temperature (e.g. 25.3 deg C)
\$				D	D	\$ display = Density setting from probe (e.g. .53 for 530 kg/m ³)
VOL	V	V	V	v	v	Vol display = Uncompensated or compensated Vol (last delivery)

Other applicable maximum permissible errors are:

- ±0.5°C for the temperature measuring device;
- ±10 kg/m³ for the density detection device;
- ±40 mL for deliveries equal to the minimum measured quantity; and
- ±1.0% for gas elimination for LPG.

Details on the calibration procedure may be found in the Gilbarco SK700-2 LPG service manual.

FIGURE 10/1/25 – 1

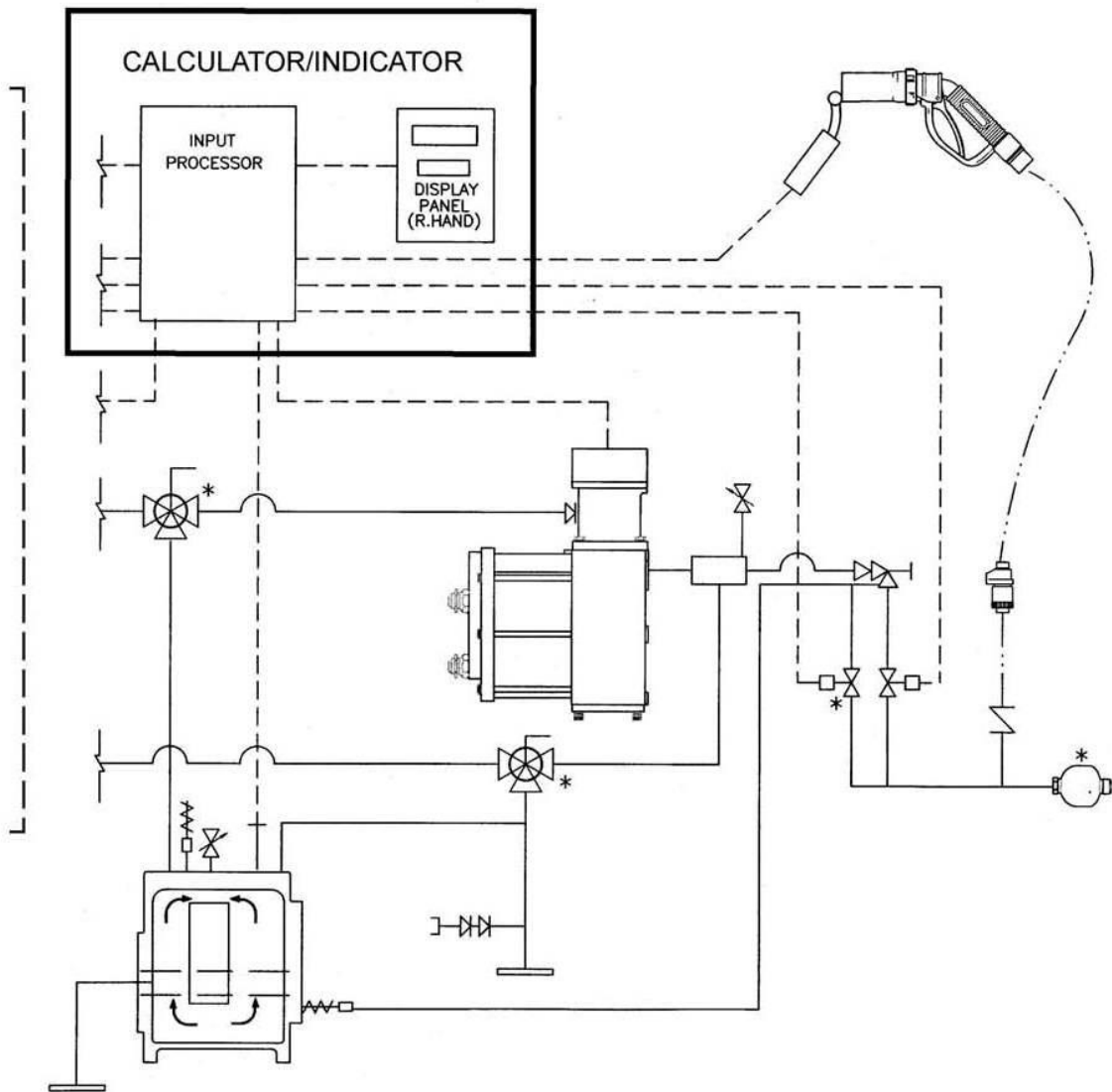


(a) Gilbarco Model T921A1ND SK700-2 ('Island Oriented Dispenser', IOD)
LPG Fuel Dispenser



(b) Gilbarco Model T922A2ND SK700-2 LPG Fuel Dispenser
(With Lane Oriented Hose)

FIGURE 10/1/25 - 2



* OPTIONAL ITEMS -

Typical LPG System Hydraulics Batchen Model Mk III LPG Flowmeter
(Single system shown for clarity)

FIGURE 10/1/25 – 3

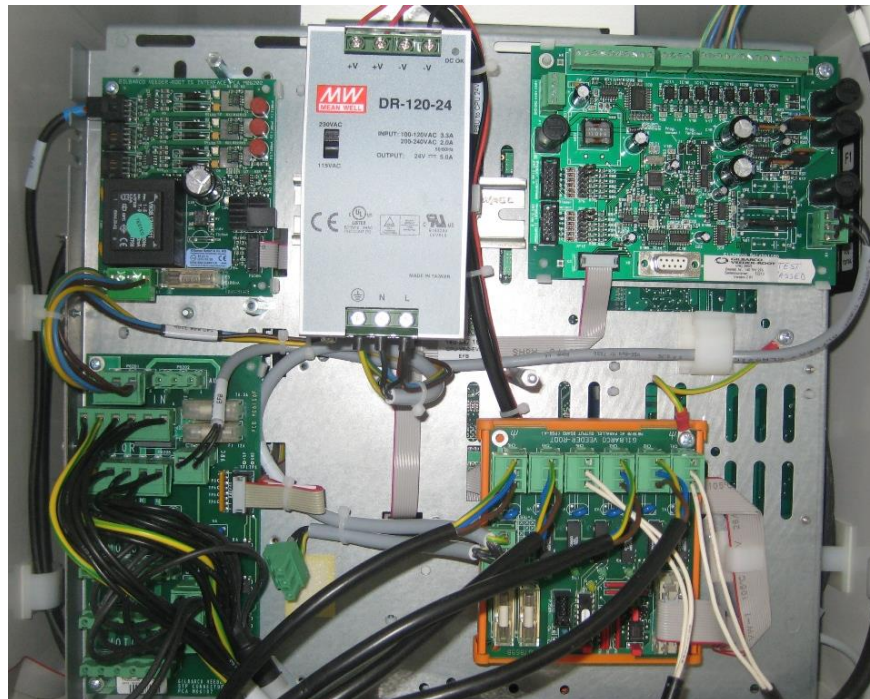


(a) Batchen Model Vapour Mk V Eliminator



(b) Batchen Model Mk III LPG Flowmeter (including sealing)

FIGURE 10/1/25 – 4



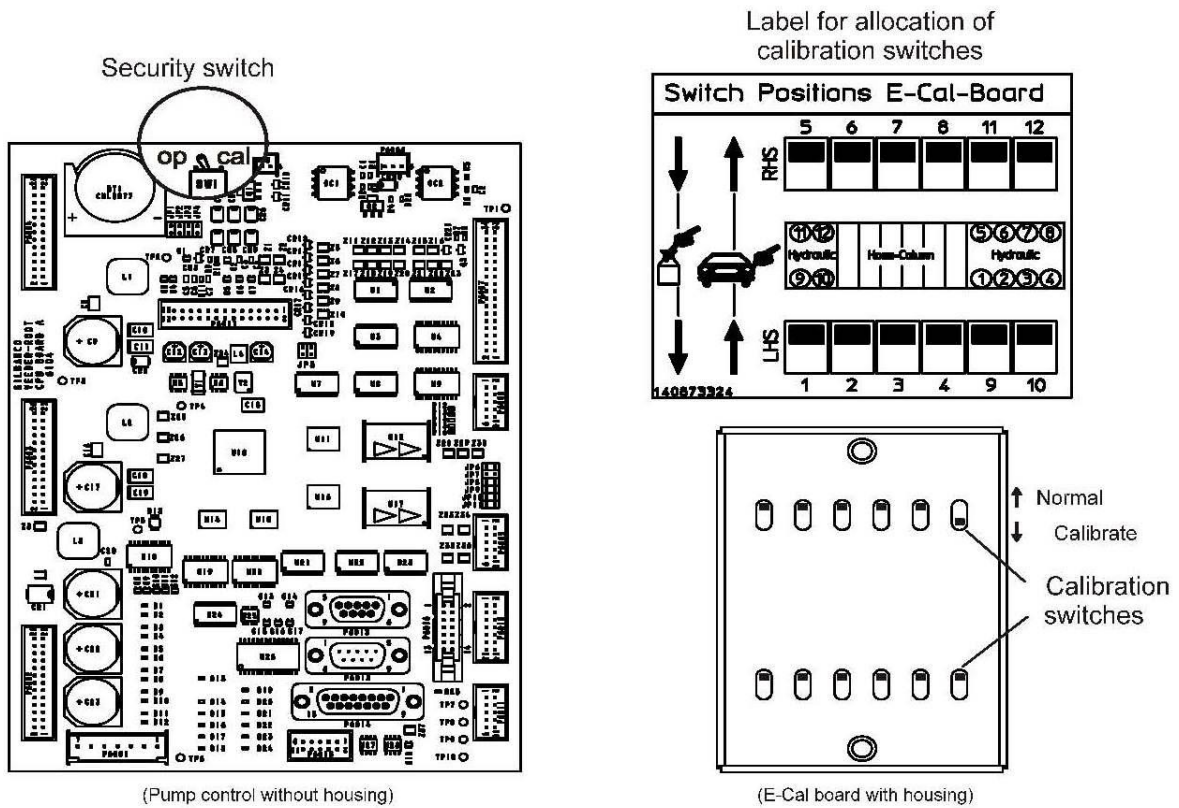
Power Supply and Driver Printed Circuit Boards



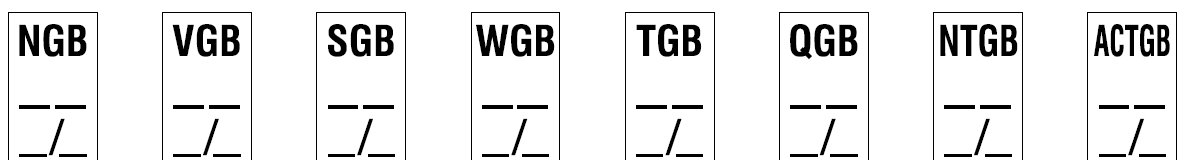
Processor PCB and Interface Cards

Sandpiper 2 Calculator/Indicator (aka Model E101) Electronics
Typical Mounting Arrangement

FIGURE 10/1/25 – 5



(a) Electronics Sealing – Sealing of LPG Meter Calibration Access (destructible adhesive labels used for security and calibration switches)



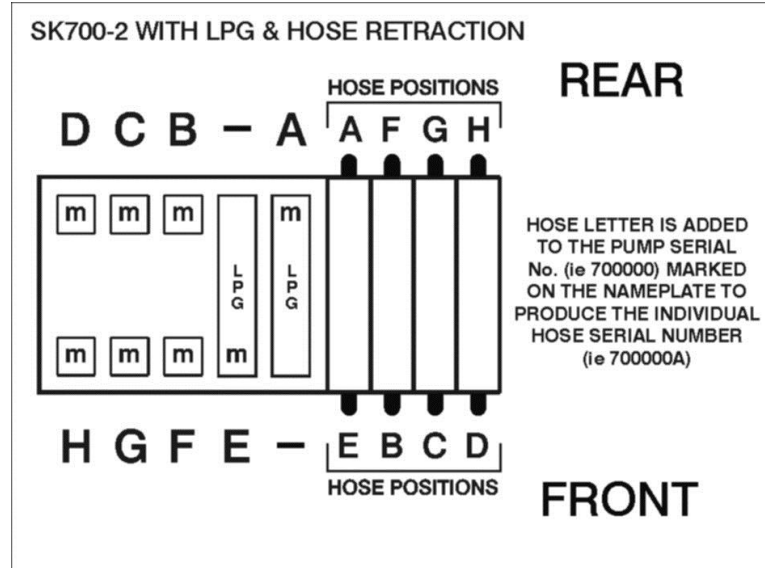
(b) Examples of different seal details

FIGURE 10/1/25 – 6

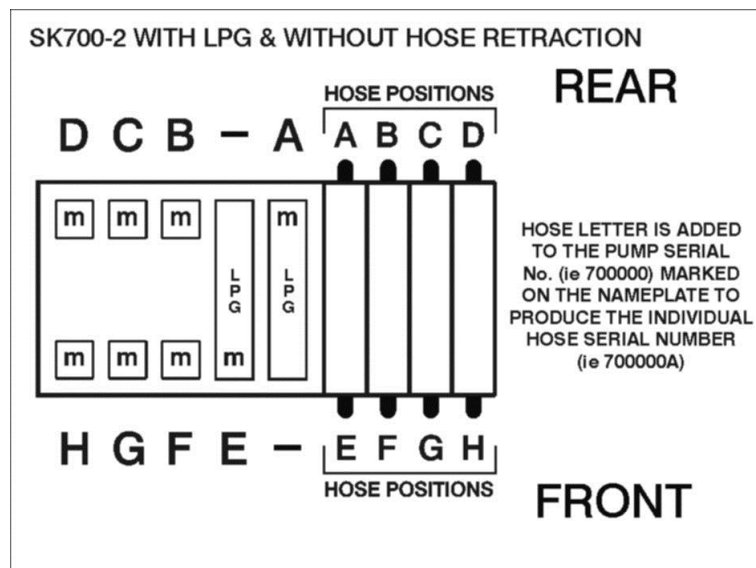
Meter mapping – For 'W & M' (trade measurement) identification

For meter selection during delivery review (see TEST PROCEDURE)

For meter A select 1, for meter E select 5



(a) Meter and hose relationship with hose retraction



(b) Meter and hose relationship without hose retraction

Meter Mapping

~ End of Document ~