



Australian Government
Department of Industry,
Innovation and Science

National Measurement Institute

Certificate of Approval

No 10/1/27

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.

Gallagher Model Pulse CS2D LPG Fuel Dispenser for Motor Vehicles

submitted by Gallagher Fuel Systems Ltd
 2 Station Road
 Marton 4741 New Zealand

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 July 2004.

This approval becomes subject to review on **1/01/19**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 approved – certificate issued	20/12/13
1	Variant 2 approved – certificate issued	10/10/14
2	Pattern amended (Field of Operation) – certificate issued	18/11/15

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 10/1/27' 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*.

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

Dr A Rawlinson

TECHNICAL SCHEDULE No 10/1/27

1. Description of Pattern approved on 20/12/13

A Gallagher model Pulse CS2D LPG fuel dispenser (Figures 1 and 2) for refuelling motor vehicles using liquefied petroleum gas (LPG). The dispenser is approved for use) in attendant-operated mode, or in self-service mode when interfaced to a compatible (#) approved self-service device.

- (#) '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 following specifies the field of operation for which the metering system is approved:

Characteristics specific to LPG metering

- Minimum measured quantity, V_{min} 5 L
- Maximum flow rate, Q_{max} 130 L/min
- Minimum flow rate, Q_{min} **2.4 or 8 L/min** (#1)
- LPG density range (at 15°C) 505 kg/m³ to 570 kg/m³
- Volume conversion to 15°C over a liquid temperature range of -10°C to 40°C
- Maximum operating pressure, P_{max} 1800 kPa
- Operating pressure is maintained at least 200 kPa above the equilibrium vapour pressure of LPG
- Ambient temperature range of -10°C to 55°C
- Accuracy Class 1.0

- (#1) Minimum flow rate for LPG of 2.4 or 8 L/min which must be so marked. The instrument shall be verified in accordance with the Q_{min} marked on the data plate.

1.2 LPG Metering System (Figures 3 and 4)

- (i) An LPG supply tank may be located either above or below the ground level.
- (ii) The pump is positioned either below the supply tank in which case the pump is designed for use in a state of flooded suction, or the pump is positioned above the supply tank in which case the pump shall be a multistage regenerative turbine LPG pump designed for use in suction lift. There shall be no restrictive fittings within ten pipe diameters of the pump inlet and the diameter of the inlet pipe is not less than the diameter of the pump inlet. The external pump by-pass relief valve is installed in a line returning to the vapour space of the supply tank. A single 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) An Endress+Hauser LPG mass coriolis meter is installed after the filter/strainer (installed at the inlet of the LPG dispenser). This provides a Modbus RS485 output to the calculator/indicator. This data is safeguarded with a CRC checksum over the data package.

- (iv) A Parker 2 stage solenoid operated valve or other compatible valve located after the meter is controlled by the calculator. If the coriolis meter detects vapour the valve is closed and the vapour allowed to condense due to the increase in supply pressure. Once the vapour is clear the valve opens and the delivery can continue.
- (v) A Parker model AD032B16T101 diaphragm hydraulic accumulator or compatible unit is fitted downstream of the solenoid-operated valve.
- (vi) A 16 mm LPG hose and/or solid piping is fitted between the hydraulic accumulator and the nozzle along with an Elaflex Ark 19 LPG breakaway.
- (vii) An Elaflex ZVG-1 LPG nozzle or any other NMI-approved compatible (#) LPG nozzle (*) may be used that is suitable for the Gallagher nozzle hang-up mechanism.
 - (*) Note that the submitter must be consulted regarding the acceptability of any alternative nozzles.
- (viii) The dispenser is provided with a recirculation line with a double check filler valve for returning the LPG back to the supply tank. The recirculation line is provided for maintenance and verification purposes.
- (#) 'Compatible' is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system.

1.3 Calculator/Indicator

The calculator/indicator comprises of a Gallagher model Pulse computing module and indicator module as described on certificate of approval S624.

The indicator comprises a single dot matrix displays showing the price, volume, plus separate displays for unit prices as well as totaliser displays for each product..

Price up to \$99999.99 in \$0.01 increments

Volume up to 99999.99 L in 0.01 L increments

Unit price up to 9999.9 ¢/L in 0.1 ¢ increments

Totaliser up to 99999999 L in 1 L increments

In attended-operated mode, electronic totals for volume are displayed at the bottom of the unit price windows.

A separate electro-mechanical totaliser may be provided to display the accumulated volume up to 9 999 999 litres.

The calculator/indicator displays the metered volume at 15°C and has facility to display the volume at operating conditions, LPG density at 15°C, and the temperature of LPG flowing through the flowmeter (refer to Test Procedure).

The calculator/indicator is approved with the software version number 1.xx.xx. The version number may be viewed using the set-up keypad (refer to Test Procedure).

1.4 Volume Conversion Device for LPG Metering

The delivery of LPG is displayed in litres at 15°C and the volume conversion is based on Table 54 published by ASTM-IP-API, '*Petroleum Measurement Tables for Light Hydrocarbon Liquids*'.

1.5 Checking Facilities

An automatic segment test is performed at the start of each delivery.

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 and stops the delivery. Error information is written to an error log stored on an SD card. In the event of a power failure the displayed value for a delivery is retained.

1.6 Verification Provision

Provision is made for the application of a verification mark.

1.7 Sealing Provision

Provision is made for sealing the mechanical calibration adjustment device on the flowmeters (Figure 4).

The flowmeter bleed valve has provision for sealing.

1.8 Markings

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

Pattern approval number	NMI No 10/1/27
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})	1800 kPa
Minimum pressure (P_{min})	200 kPa above vapour pressure
Approved for LPG density range	505 kg/m ³ to 570 kg/m ³ (at 15°C)
Maximum liquid temperature (T_{max})	50°C
Minimum liquid temperature (T_{min})	-10°C
Accuracy class	class 1.0

Note: 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'.

Volume indicated for LPG shall be clearly identified as 'Litres at 15°C' or similar wording.

2. Description of Variant 1 approved on 20/12/13

Certain other models and configurations of the Pulse series of LPG fuel dispensers as identified in Table 1 below, including in L series (as distinct from the pattern, C series) which uses an L-shaped dispenser with all the hoses at one end (Figure 6).

TABLE 1 – Approved Models of the Pulse LPG Series

Models numbers are in the form 'model Pulse CS2D' (the pattern), where:

First position; shape of the device

- L An L-shaped dispenser with all the hoses at one end
- C A compact dispenser with hoses on either side of the display
- P A pedestal mounted device

Second position; the base size and arrangement

- X large base
- S Small base
- N Nano base

Third position; the number of hoses

A number, either 1 or 2

Fourth position; the type of device.

- D A dispenser with the product supplied under pressure from a submersible turbine pump (STP) hydraulic system/s

3. Description of Variant 2 approved on 10/10/14

A check valve may be installed between the filter and the 3-way valve (Figure 7)

TEST PROCEDURE No 10/1/27

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

Test Procedure to View Software version number

- To view the current software version
- Hold the fill key down for 3 seconds.
- Enter service mode using the FILL key and password.
- Press 8 to go to firmware function.
- The display will display FIRMW and on the line below the software version will be displayed
- Press C to get out of this mode.

LPG Special Calibration Check Mode

1. Before commencing this procedure, check that the two meter housing covers are secured in place with wire/lead seals.
2. If the seals are not in place, then remove the large cover, (after first removing power from the dispenser – you are opening a flameproof enclosure) and check that the dipswitches are correctly positioned – from left to right: down, down, up, up (Figure 5).
3. Replace the cover before re-powering the dispenser.
4. Insert the wire/lead seals after the calibration check is completed.
5. Enter service mode, using FILL key and password.
6. Using the 2 or 8 keys, cycle to 'STACK 1000'.
7. Press the 5 key.
8. '*****' shows in the LPG price display to confirm that the key press has taken you into service mode.
9. Press and hold C to leave service mode.
10. Replace the LPG nozzle with a 'dummy' nozzle in the holster while the hose is connected to the external measuring equipment.
11. Use the dummy nozzle to control the start and finish of each test delivery. Do not open the hose nozzle at the start of a delivery until after the pressurisation 'bars' have disappeared from the main display.
12. When delivering:
 - a. Temperature corrected volume is displayed in the litres display.
 - b. The uncompensated litres value is displayed in the LPG tote display. No decimal point can be shown, so two decimals is assumed.
 - c. 'VCF' (volume correction factor); 'D15' (density corrected to 15°C); and 'T' (liquid temperature) are displayed in sequence in the LPG unit price display. Correction factor and density display with 3 decimals, temperature with one.
13. When procedure is completed, press FILL to cancel the special test mode.
14. The test mode may expire automatically after 15 minutes of no activity if the FILL key wasn't pressed.

FIGURE 10/1/27 – 1



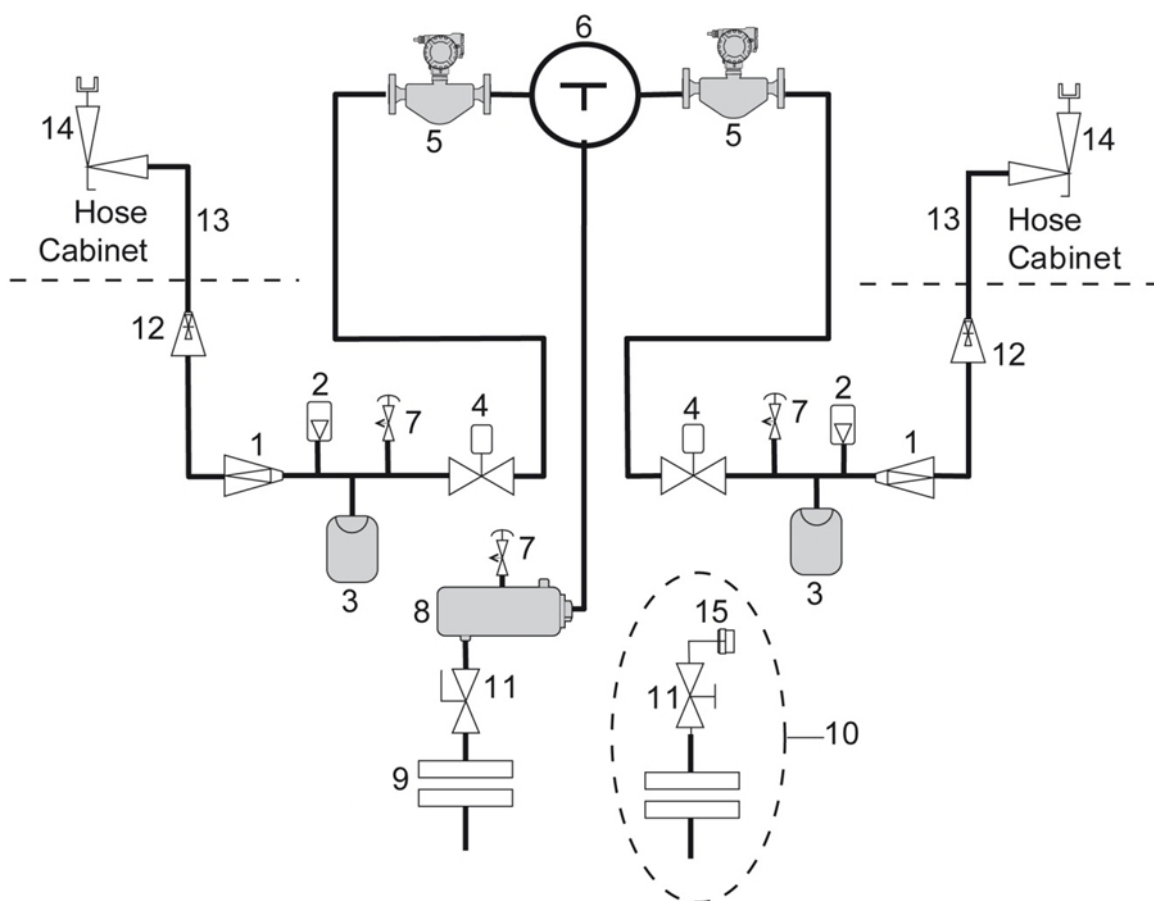
Gallagher Model Pulse CS2D LPG Fuel Dispenser for Motor Vehicles (Pattern)

FIGURE 10/1/27 – 2



Gallagher Model Pulse CS2D LPG Hydraulics – The Pattern

FIGURE 10/1/27 – 3



- | | |
|-----------------------------|--|
| 1. Excess Flow Valve | 9. Inlet Flange |
| 2. Hydrostatic Relief Valve | 10. Return Line Assy (Installation) |
| 3. Hydraulic Accumulator | 11. Manual Shut Off Valve |
| 4. 2 Stage Solenoid Valve | 12. Dry Break Coupling |
| 5. LPG Mass Flow Meter | 13. Delivery Hose Assy |
| 6. 4-Way Meter Feeder Valve | 14. Dispensing Nozzle |
| 7. Needle Valve | 15. Acme 1- 3/4" Male Test Point Adaptor |
| 8. Filter/Housing | |

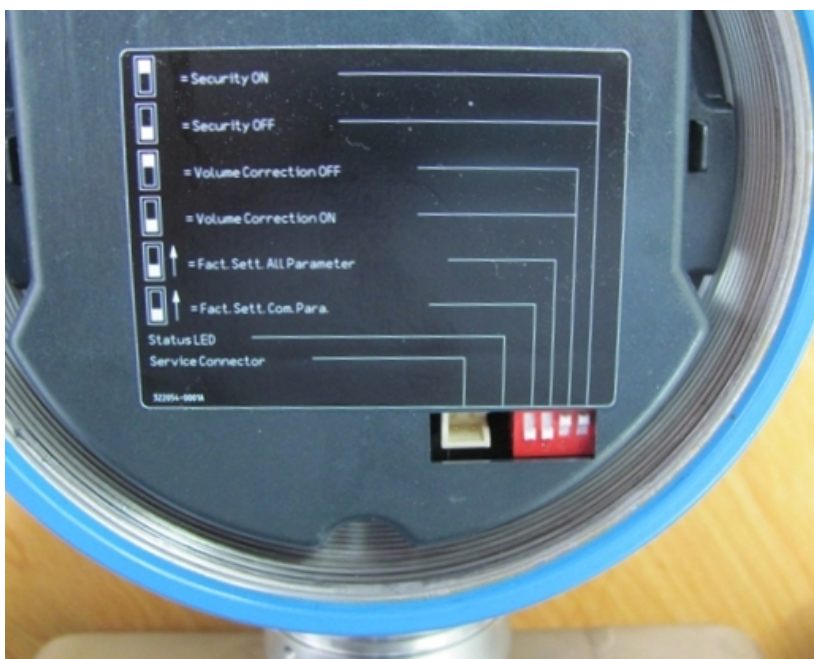
Typical LPG Hydraulics – Gallagher Model Pulse CS2D LPG Fuel Dispenser
(Pattern)

FIGURE 10/1/27 – 4



A Typical Sealing Method – Endress+Hauser LPG Meter – The Pattern

FIGURES 10/1/27 – 5



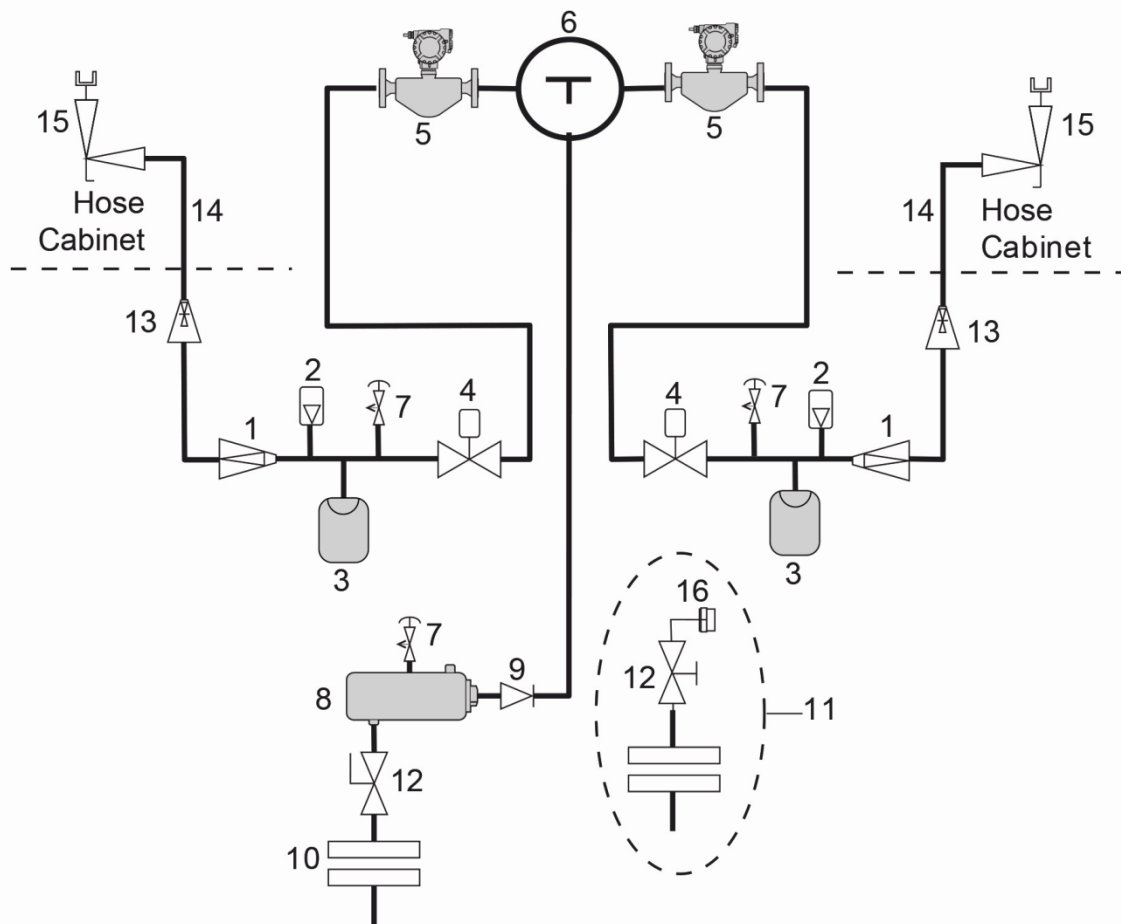
LPG Meter DIP Switch Settings

FIGURES 10/1/27 – 6



Model Pulse LS2D LPG Fuel Dispenser in L-shaped Housing – Variant 1

FIGURE 10/1/27 – 7



- | | |
|-----------------------------|--|
| 1. Excess Flow Valve | 9. Check Valve |
| 2. Hydrostatic Relief Valve | 10. Inlet Flange |
| 3. Hydraulic Accumulator | 11. Return Line Assy (Installation) |
| 4. 2 Stage Solenoid Valve | 12. Manual Shut Off Valve |
| 5. LPG Mass Flow Meter | 13. Dry Break Coupling |
| 6. 4-Way Meter Feeder Valve | 14. Delivery Hose Assy |
| 7. Needle Valve | 15. Dispensing Nozzle |
| 8. Filter/Housing | 16. Acme 1- 3/4" Male Test Point Adaptor |

Typical LPG Hydraulics – Gallagher Pulse LPG Fuel Dispenser (Variant 2)

~ End of Document ~