



Australian Government  
Department of Industry,  
Innovation and Science

**National  
Measurement  
Institute**

**Certificate of Approval**

**No 5/6M/4**

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 CX6P 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 1/11/18, and then every 5 years thereafter.

**DOCUMENT HISTORY**

Rev	Reason/Details	Date
0	Pattern & variants 1 & 2 provisionally approved – interim certificate issued	4/10/13
1	Pattern & variants 1 & 2 approved – certificate issued	29/11/13
2	Variant 1 amended (add Table 1) – certificate issued	24/01/14
3	Variant 3 approved – certificate issued	10/10/14
4	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 5/6M/4' 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 read 'Dr A Rawlinson', with a horizontal line underneath.

**Dr A Rawlinson**

TECHNICAL SCHEDULE No 5/6M/4

**1. Description of Pattern** **provisionally approved on 4/10/13**  
**approved on 29/11/13**

A Gallagher model Pulse CX6P multi-product fuel dispenser (Figures 1 and 2) for delivering LPG, distillate or various grades of fuels (\*), and/or Diesel Exhaust Fluid (DEF) to motor vehicles in attendant-operated mode, or in self-service mode when interfaced to a compatible (#) approved self-service device.

- (\*) Including up to 85% ethanol (E10) and various grades of pure biodiesel and biodiesel/distillate blends (to Australian government standard).
- (#) '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 common to all systems**

- Ambient temperature range -10°C to 55°C

**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/m<sup>3</sup> to 570 kg/m<sup>3</sup>
- 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
- Accuracy Class 1.0

**Characteristics specific to petrol/diesel metering**

- Minimum measured quantity,  $V_{min}$  2 L
- Maximum flow rate,  $Q_{max}$  80 L/min
- Minimum flow rate,  $Q_{min}$  5 L/min
- Maximum pressure of the liquid,  $P_{max}$  350 kPa
- Minimum pressure of the liquid,  $P_{min}$  100 kPa (#2)
- Range of liquids viscosity (at 20°C) 0.5 to 20 mPa.s (#3)
- Maximum temperature of the liquid,  $T_{max}$  50°C
- Minimum temperature of the liquid,  $T_{min}$  -10°C
- Accuracy class 0.5

(#3) 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.

(#2) Minimum pressure required for effective operation of the gas elimination device.

(#3) The flowmeter is adjusted for use with one product viscosity. Fuels include kerosene, distillate and various grades of petrol (which may include up to 85% ethanol). The pattern and variants constructed for use to dispense various grades of pure biodiesel and biodiesel/distillate blends (to Australian government standard).

### Characteristics specific to Diesel Exhaust Fluid (DEF) metering

- Minimum measured quantity,  $V_{min}$  2 L
  - Maximum flow rate,  $Q_{max}$  40 L/min
  - Minimum flow rate,  $Q_{min}$  4 L/min
  - Maximum pressure of the liquid,  $P_{max}$  320 kPa
  - Minimum pressure of the liquid,  $P_{min}$  50 kPa
  - Dynamic viscosity 1.4 mPa.s (at 25°C) (##)
  - Maximum temperature of the liquid,  $T_{max}$  30°C
  - Minimum temperature of the liquid,  $T_{min}$  0°C
  - Accuracy class 0.5
- (##) The dispenser is adjusted to be correct for Diesel Exhaust Fluid (AUS32 - aqueous urea solution 32.5%) for which it is to be verified.

### 1.2 LPG Metering System (Figures 3 and 4)

- (i) An Endress+Hauser LPG mass coriolis meter is installed after the filter (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.
- (ii) 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.
- (iii) A Parker model AD032B16T101 diaphragm hydraulic accumulator or compatible unit is fitted downstream of the solenoid-operated valve.
- (iv) 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.
- (v) 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.
- (vi) 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 Petrol/diesel and DEF Metering Systems

As described in the documentation of approval NMI 5/6A/229.

## **1.4 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, any pre-set amount, plus separate displays for unit prices as well as totaliser displays for each product. The display panel is also be fitted with a pre-set keypad.

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  
Preset up to \$999 in \$1 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.

For the LPG flowmeter, 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).

## **1.5 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 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*'.

## **1.7 Verification Provision**

Provision is made for the application of a verification mark.

## **1.8 Sealing Provision**

Provision is made for sealing the mechanical calibration adjustment device on the flowmeters (Figures 5 and 6). For petrol/diesel, the gas separator test valve has provision for sealing.

## 1.9 Markings

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

Pattern approval number	NMI No 5/6M/4
Manufacturer's identification mark or trade mark	.....
Manufacturer's designation (model number)	.....
Serial number	.....
Year of manufacture	.....
Environmental class	class N

### For LPG

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 <sup>3</sup> to 570 kg/m <sup>3</sup> (at 15°C)
Maximum liquid temperature ( $T_{max}$ )	50°C
Minimum liquid temperature ( $T_{min}$ )	-10°C
Accuracy class	class 1.0

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

### For Petrol/Diesel - in accordance with approval NMI 5/6A/229 including:

Pattern approval number	NMI No 5/6A/229
Minimum measured quantity, $V_{min}$	..... L (#1)
Maximum flow rate ( $Q_{max}$ )	..... L/min
Minimum flow rate ( $Q_{min}$ )	..... L/min
Maximum operating pressure ( $P_{max}$ )	..... kPa
Minimum operating pressure ( $P_{min}$ )	..... kPa
Type of liquid	.....
Nature of liquids to be measured	..... (#2)
Maximum temperature of the liquid, $T_{max}$	.....°C (#3)
Minimum temperature of the liquid, $T_{min}$	.....°C (#3)
Accuracy class	0.5

### For Diesel Exhaust Fluid (DEF)

Minimum measured quantity, $V_{min}$	..... L (#1)
Maximum flow rate ( $Q_{max}$ )	..... L/min
Minimum flow rate ( $Q_{min}$ )	..... L/min
Maximum operating pressure ( $P_{max}$ )	..... kPa
Minimum operating pressure ( $P_{min}$ )	..... kPa
Dynamic viscosity	.....
Maximum temperature of the liquid, $T_{max}$	.....°C
Minimum temperature of the liquid, $T_{min}$	.....°C
Accuracy class	0.5

- (#1) 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) e.g. 'petrol', 'distillate', 'P' or 'D'.
- (#3) Required if liquid temperature range differs from -10°C to 50°C.

## 2. Description of Variant 1 provisionally approved on 4/10/13 approved on 29/11/13

Certain other models and configurations of the Pulse series of multiple-fuel fuel dispensers including in L series (as distinct for the pattern, C series) which uses an L-shaped dispenser with all the hoses at one end (Figure 7) identified using Table 1 below.

## 3. Description of Variant 2 provisionally approved on 4/10/13 approved on 29/11/13

For non-LPG metering, with two Tatsuno model FP1001 pump/strainer/gas separators working in parallel feeding a single Tatsuno model FM-1002-A21#001 Lobetype positive displacement meter (Figure 8) fitted with a Gallagher model #2A33866 pulse generator that communicates the volume of fluid measured to the indicator.

- Minimum measured quantity,  $V_{min}$  5 L
- Maximum flow rate,  $Q_{max}$  160 L/min
- Minimum flow rate,  $Q_{min}$  16 L/min

TABLE 1 – Approved Models of the Pulse Series

Models numbers are in the form 'model Pulse CX6P' (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

### Second position; the base size and arrangement

- X large base
- S Small base
- N Nano base
- A Back to back model with two large bases
- B Back to back with one large base and one small base
- E Back to back model with two small bases
- F Back to back model with one large and one nano base
- G Back to back model with two nano bases
- H Back to back model with one small and one nano base

### Third position; the number of hoses

A hexadecimal number from 1 to F, where F = 15 hoses

### Fourth position; the type of device.

- P A suction device using pump/s and air separator/s
- D A dispenser with the product supplied under pressure from a submersible turbine pump (STP) hydraulic system/s
- M Mixed, a device with products requiring pressure and suction

## 4. Description of Variant 3 approved on 10/10/14

A check valve may be installed between the filter and the 3-way valve (Figure 10)

## TEST PROCEDURE No 5/6M/4

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 9).
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 5/6M/4 – 1



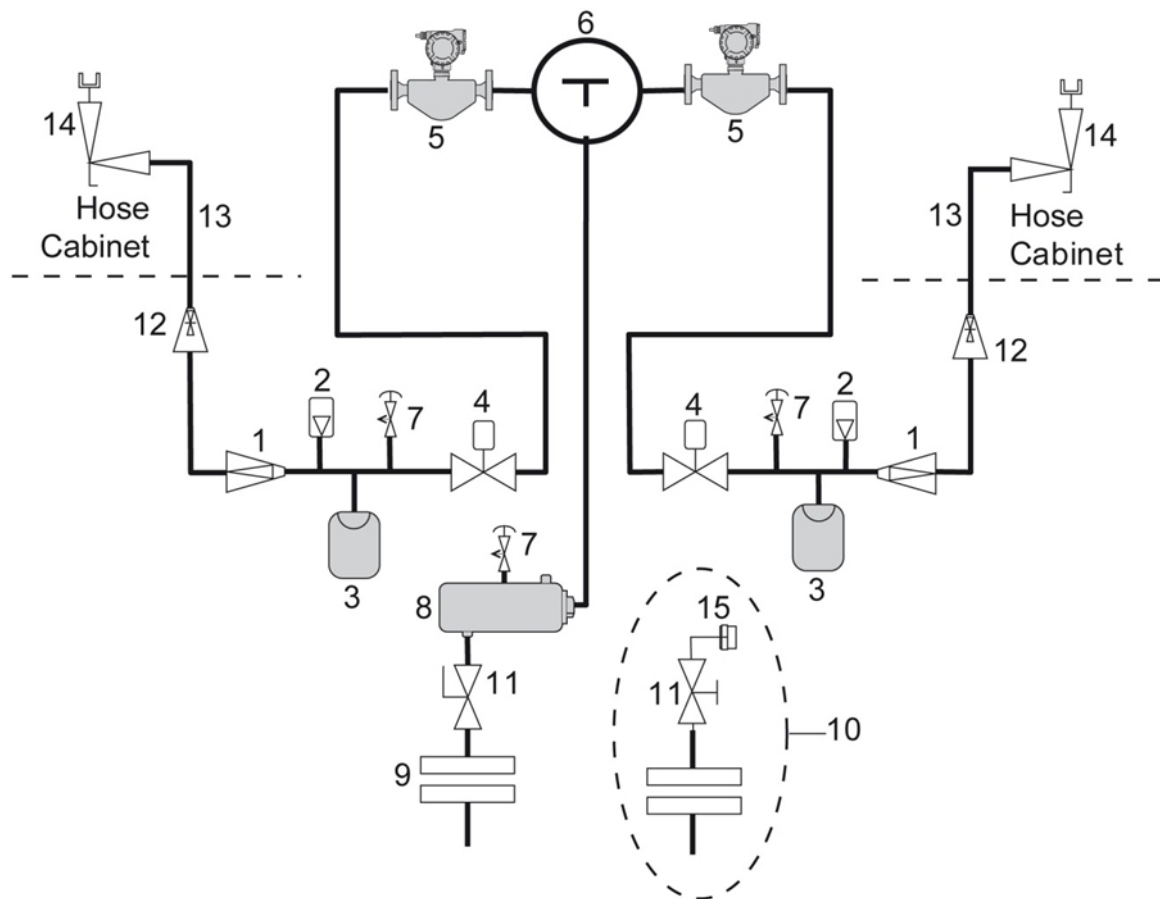
Gallagher Model Pulse CX6P Fuel Dispenser for Motor Vehicles – The Pattern

FIGURE 5/6M/4 – 2



Gallagher Model Pulse CX6P Hydraulics – The Pattern

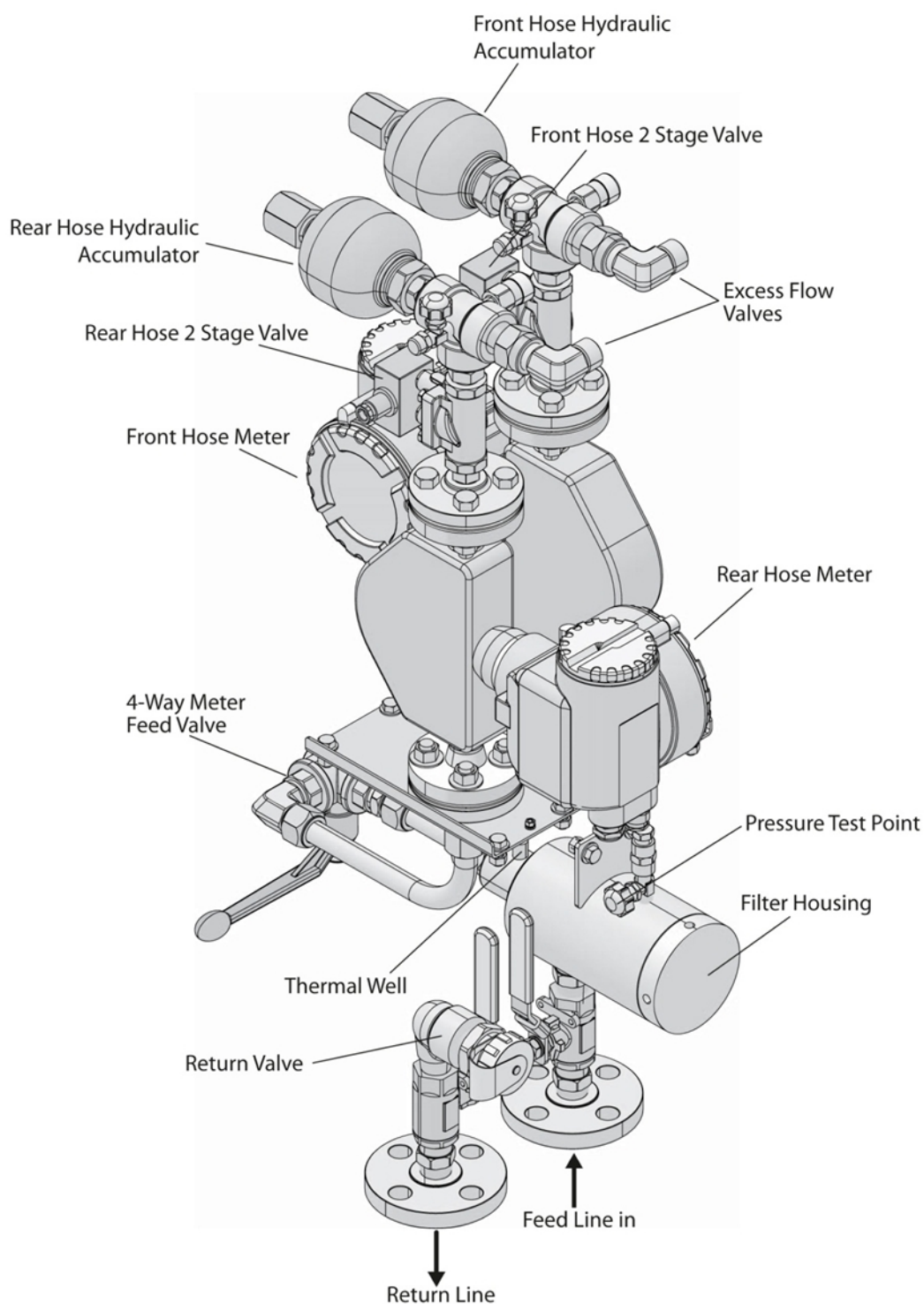
FIGURE 5/6M/4 – 3



- |                             |  |
|-----------------------------|--|
| 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 Fuel Dispenser (Pattern)

FIGURE 5/6M/4 – 4



Typical Non-LPG Hydraulics – Gallagher Model Pulse Fuel Dispenser



FIGURE 5/6M/4 – 5



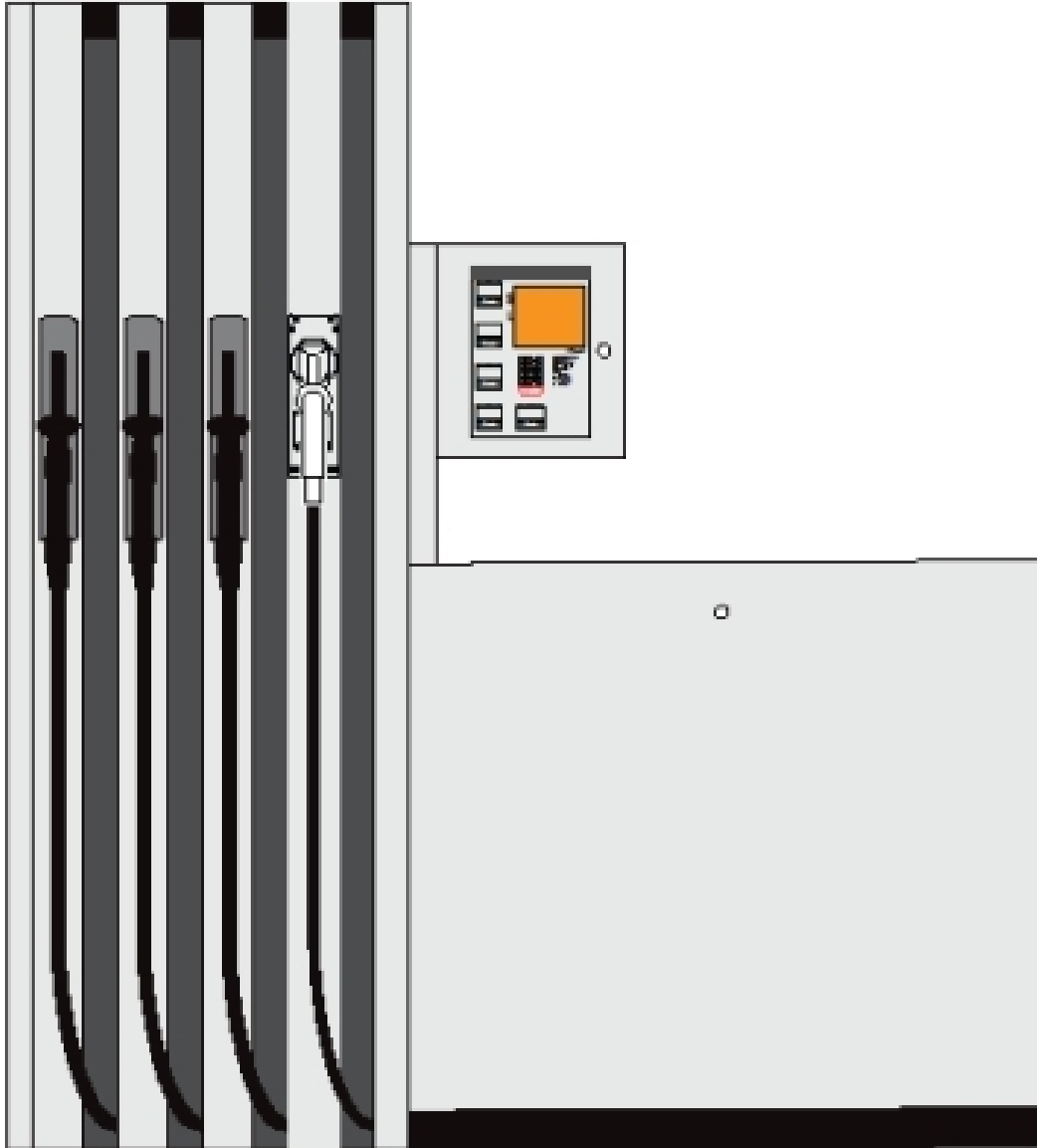
A Typical Sealing Method – Endress+Hauser LPG Meter – The Pattern

FIGURE 5/6M/4 – 6



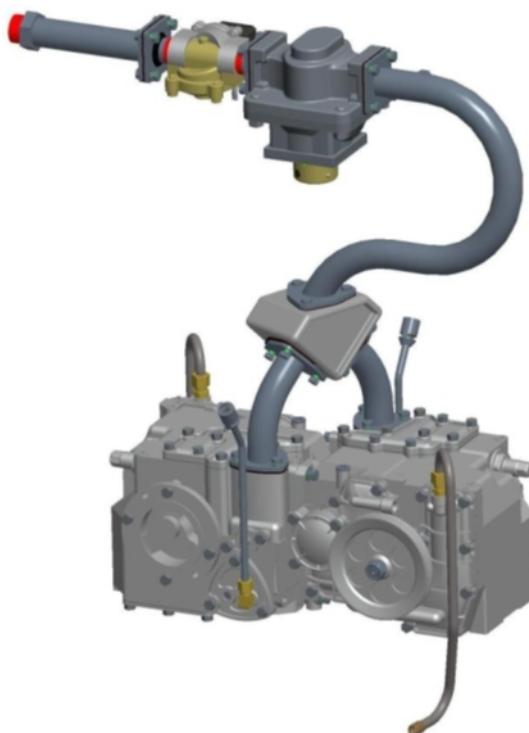
A Typical Sealing Method – Tatsuno Non-LPG Meter – The Pattern

FIGURES 5/6M/4 – 7



Model Pulse LX8P Fuel Dispenser in L-shaped Housing – Variant 1

FIGURES 5/6M/4 – 8



With Two Tatsuno Pump/strainer/gas Separators  
Feeding a Single Tatsuno Lobetype Meter – Variant 2

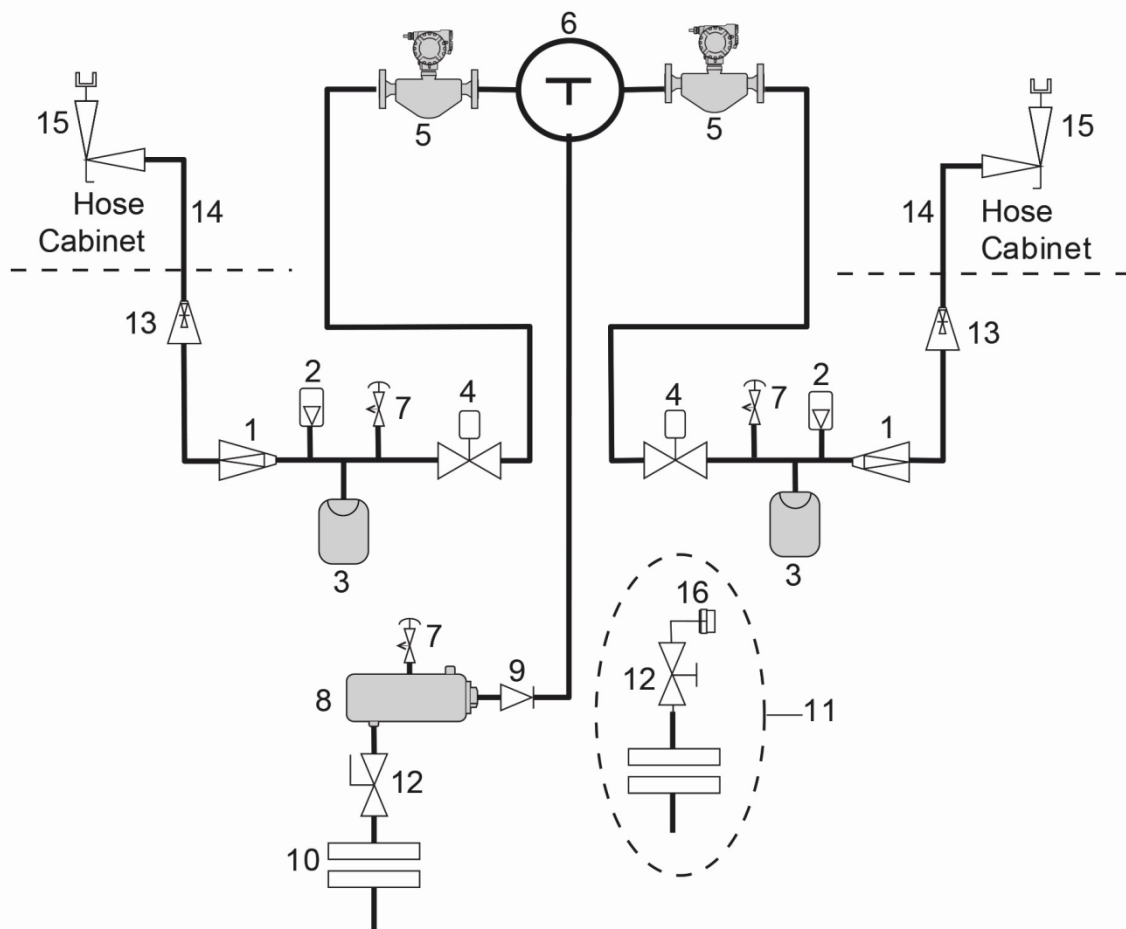
FIGURES 5/6M/4 – 9



LPG Meter DIP Switch Settings



FIGURES 5/6M/4 – 10



- |                             |  |
|-----------------------------|--|
| 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 Model Pulse Fuel Dispenser (Variant 10)

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