

# Certificate

## Pursuant to section 12 of the Weights and Measures Act 1985

*Certification No 2797 Revision 2*

*Valid Until 30 September 2016*

*In accordance with the provisions of section 12 of the Weights and Measures Act 1985, the Secretary of State for Business, Innovation & Skills hereby certifies as suitable for use for trade a pattern of a road tanker meter measuring system, as described in the descriptive annex to this Certificate, and having the following characteristics:-*

*A vehicle mounted electronic liquid fuel meter measuring system, fitted with a wet-hose hydraulic system based on, EC standard scheme 3, but having an electronic register control system. The control system can calculate price to pay where required, and controls delivery functions and the operation of the special gas extractor.*

<i>Model designation:</i>	<i>50 mm</i>
<i>the maximum rate of flow:</i>	<i>400 litres/minute</i>
<i>the minimum rate of flow:</i>	<i>150 litres/minute</i>
<i>the minimum delivery:</i>	<i>500 litres</i>
<i>the liquids measured:</i>	<i>Mineral products with a dynamic viscosity of 0.4 to 20 mPa.s</i>

*Note: This certificate relates to the suitability of the equipment for use for trade only in respect of its metrological characteristics. It does not constitute or imply any guarantee as to the safety of the equipment in use for trade or otherwise.*

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## **CERTIFICATION NO 2797**

### **1 INTRODUCTION**

This pattern of a vehicle mounted electronic liquid fuel meter measuring system, Figure 1, comprises a four-compartment tanker fitted with a wet-hose hydraulic system, EC standard scheme 3, having a pulse generator fitted to the output shaft to drive the litre counter/control box and a receipt printer. The litre counter/control box has an LED batch and totaliser display. The minimum delivery for the system is 500 litres. The batch display indicates to 99999.9 litres, the totaliser to 99999999 litres. Delivery information is entered into the system, either by hand at the point of delivery or by computer at the vehicle depot via an input device, Portamat. The system is able to calculate a price-to-pay for a transaction when a unit price has been previously specified for that delivery.

Alternatives include:

- (i) tankers with 1, 2, 3, 5, 6 or 7 compartments
- (ii) using other EC-approved meters and air separators.

### **2 CONSTRUCTION**

#### **2.1 Mechanical**

The tanker consists of a tank, divided into four compartments, rigidly mounted onto the vehicle chassis. Each compartment is equipped with a top loading dipstick system and man-way, and adjacent to each man-way there is a foot-valve operating lever. From each foot valve at the base of the compartments, rigid piping runs underneath the tank to approximately its centre where the four faucet valves are situated. The cargo pump and meter box are mounted on the right of the faucet valves underneath the tank. The hose reel and the litre counter/control box are situated between the tank and the vehicle cab.

The input device, the Portamat, which can be easily removed from the vehicle for loading and downloading transaction and journey information to a depot computer, is mounted on a stand between the driver and passenger seats. The receipt printer is mounted on the rear wall of the vehicle cab.

#### **2.2 Hydraulic**

The 50 mm wet-line hydraulics, Figure 6, consist of four compartments, each with a foot valve and faucet valve. A flexible “jumper” hose connects one compartment to the cargo pump inlet. The pump is a Drum AD system hydraulically driven from the vehicle power takeoff arranged to maintain a constant delivery pressure whilst fuel is being delivered but reducing when it is not. The hydraulic liquid used to drive the pump is cooled using a heat exchanger around the fuel inlet to the pump, the fuel being used to cool the liquid. The pumped fuel passes through the gas extractor to the meter. The fuel then passes through the two-stage preset valve to the hose reel which terminates in the nozzle valve. The system is an EC standard scheme 3 arrangement and complies with that approved in Certificate UK 82/1795.

### **2.2.1 Meter**

The meter manufactured by Schlumberger (Neptune), Figure 2, is a positive displacement oscillating piston principle meter. It is of 50 mm nominal bore as described in Certificate No 1766 but having the indicator removed and the pulser installed in its place.

### **2.2.2 Gas extractor**

The gas extractor manufactured by Schlumberger (Neptune) works on the chamber and float principle, the float falling as the liquid falls opening the chamber vent. Incorporating a strainer, it is of 50 mm nominal bore and is as described in Certificate No 1767. The vapour/froth line from the gas extractor is of such a material that if crushed or deformed it will not subsequently recover its shape.

### **2.2.3 Delivery valve**

The delivery valve, situated at the outlet of the meter, is a two-stage, fast and slow fill, air-operated valve. The solenoids controlling air to the valve are actuated by the litre counter/control box.

## **2.3 Electronics**

The main electronics for the system are contained in the litre counter/control box, the input device (Portamat), the pulser and the printer.

**2.3.1** The litre counter/control box, Figure 3, receives data from the pulser, calculates the delivered volume, and displays batch and total quantities. The keypad is used to manually enter delivery data and to give manual control of deliveries. It also handles communication between the electronic units of the system and controls the preset valve.

**2.3.2** The input device (Portamat), Figure 4, which can be loaded with delivery information from a depot computer supplies quantity and fuel data to the litre counter/control box from memory. It collects and processes data from the litre counter/control box during transactions. The device incorporates eight function keys, with adjacent prompting LED display, for stepping through delivery sequence and number pad for delivery number entries. At the top of the device is an LCD for displaying quantity and grade of fuel to be delivered and error codes.

**2.3.3** The pulser is a dual train 50-slot magnetic instrument giving an output of approximately 10 pulses per litre, the meter having a cyclic volume of 1.057205 litres.

**2.3.4** The printer is a tractor feed dot matrix printer with paper detect.

## **2.4 Electrical**

The main dc supply to the system is from the vehicle 24 V battery. The input device contains a ni-cad battery for stored data retention and the litre counter/control box has battery backup of the batch and total display in case of vehicle battery failure via an internal ni-cad battery.

## **2.5 Display and legends**

The litre counter/control box carries a batch and totaliser display. This is an LED 12 mm high and of 99999.9 litres capacity when showing delivered quantity and 99999999 litres when showing the total. In both cases leading zeros are suppressed. A preceding upper case “L” is displayed when showing delivered quantity. To the right of the display is a keypad. Beneath the display are six push buttons with associated lamps and legends. The buttons are marked F1 to F6 from left to right. Button F1 has three lamps above it marked PRESET, TOTAL and BATCH. Button F2 has one lamp marked PRODUCT. Button F3 has two lamps above it marked Start and Stop. Button F4 has one lamp above it marked “Not Full Cust”. Button F5 has one lamp marked “Not Full Supplier”, and button F6 has one lamp marked “Full”.

The system carries a data plate, Figure 7, bearing the tank manufacturer’s name; a statement that the system is a standard scheme 3 as defined in Council Directive 77/313/EEC as amended; the certificate number; and the metrological characteristics of the system.

## **2.6 Sealing**

In addition to the normal meter measuring system sealing points, two pulser retaining bolts shall be sealed to prevent unauthorised adjustment or dismantling.

## **3 OPERATION**

**3.1.1** Before the vehicle leaves the depot, the driver enters his/her initialising data directly into the input device: ie date, driver’s number, truck number, and trip number. Delivery data may previously have been entered into the input device from the depot computer.

**3.1.2** On arrival at the delivery point the driver initiates either a planned or unplanned delivery. For the former he/she then enters into the input device a delivery number from the list loaded at the depot. For a non-prearranged delivery he/she has to enter the quantity and grade of fuel to deliver. In both cases the litre counter/control box then displays the quantity to be delivered and the transaction number at that site. Having acknowledged that the correct delivery data is shown on the litre counter/control box, it will then show the quantity and grade of fuel to be delivered.

**3.1.3** Having engaged the vehicle power takeoff to drive the cargo pump, the delivery nozzle is opened and placed in the tank to be filled. Having connected the jumper hose to the correct compartment the foot and faucet valves are opened.

**3.1.4** To start the delivery the Start button, F3, on the counter/control box is pressed. The display then blanks, shows “TEST” and then zeros. The delivery starts. When approximately 50 litres short of the preset quantity is reached the delivery valve closes to slow flow state and the delivery is completed.

**3.1.5** Having satisfactorily completed the delivery the “Not Full Customer”, “Not Full Supplier” or “Full” and then the “E” buttons are pressed to complete the transaction. The litre counter/control box now shows “END”. A receipt, Figure 5, is printed in the cab.

**3.1.6** The display now blanks but either the batch or totaliser quantities can be recalled by pressing F1.

**3.1.7** If the Start button is pressed during a delivery the delivery valve closes completely and the system awaits a “Start” or “Complete” command.

**3.1.8** The delivery valve, faucet and foot valve are closed, the hose rewound and the PTO disengaged.

## **3.2 Interlocks and security features**

**3.2.1** If the system is operated with the pulser electrically disconnected an error is detected and no delivery is possible.

**3.2.2** If the system is operated with no paper in the printer an error is detected when the “Completed” button is pressed and this cannot be cleared without inserting paper and no further deliveries can be made.

**3.2.3** Any receipts for a transaction printed after the initial one are clearly marked “DUPLICATE”.

## **4 ALTERNATIVES**

**4.1** As described above, but having a 1, 2, 3, 5, 6 or 7-compartment tanker.

**4.2** Having an alternative EC-approved meter of cyclic volume approximately ten litres.

**4.3** Having an alternative equivalent EC-approved air separator.

**4.4** Having a small expansion tank (Figure 8) fitted to the vent pipe line, above the manifold, below the vent valve. The device allows any air, which is entrained in the liquid in the vent pipe, to separate more easily and exit via the upper part of the vent pipe. The “expansion tank” has a slope on its base to aid liquid drainage back into the manifold. It has no communication with atmosphere other than via the vent pipe.

## **4.5 Product transfer**

**4.5.1** Open guard-bar method

Having the product return system modified to permit unlimited product return, including transfer of product from one compartment to another. The modifications are described below.

**4.5.1.1** Operation

The system uses the product transfer guard bar in the open position during product transfer operations and cannot be closed with the hose attached.

**4.5.1.1.1** To activate the product transfer process, the product transfer master control knob on the control panel is pulled. This sends a pneumatic signal to the electronic meter control box to enable overprinting of the ticket with the product return-to-tank message, and to close the shut-off valve in the product line downstream of the meter. It also releases the lock on the product transfer guard bar allowing it to be opened and the hose to be connected

to the product return connector. The overprint message is generated by the LC-98 litre counter as described in Certification No 2098/4.

**4.5.1.1.2** To initiate product transfer, a ticket is inserted in the printer, the preset quantity is entered on the litre counter and START is pressed. When the preset amount has been reached, pumping automatically stops. The end of delivery is acknowledged and a ticket is automatically printed with the product return-to-tank overprint message on it. The blowdown knob on the control panel is pulled and blowdown clears the product return pipework to enable the hose to be removed without spillage. The blowdown occurs downstream of the trigger nozzle thereby leaving the wet-hose full. The hose is disconnected, the product transfer guard bar is closed and the product transfer master control knob is pressed to release the product return-to-tank overprint message in the litre counter.

#### **4.5.2** Closed guard-bar method

As described in Sections 4.5.1 and 4.5.1.1 above, except that during the product transfer/return operation, the product return guard-bar is closed and locked in position by pressing the product return guard-bar knob.

#### **4.5.3** Security features and interlocks

##### **4.5.3.1** Open guard-bar method

**4.5.3.1.1** The product transfer master control knob must be pulled out to activate the product transfer process.

**4.5.3.1.2** The product transfer master control knob must be pulled out to ensure that the ticket will have the product returned-to-tank overprint message on it.

**4.5.3.1.3** If the product transfer master control knob is pushed in during a product transfer operation, the process will be terminated and a product return ticket will be automatically printed.

**4.5.3.1.4** If the product transfer master control knob is pulled out during a normal delivery, the delivery will be terminated and a ticket automatically printed.

**4.5.3.1.5** When the product transfer knob is pulled out, it closes the shut-off valve in the product line downstream of the meter

**4.5.3.1.6** The product returned-to-tank message will always be present if a ticket is printed with either the product transfer guard bar or the product transfer master control knob open or both are open together.

**4.5.3.1.7** Both the product transfer master control knob and the product transfer bar must be closed to clear the system for the next trade delivery.

##### **4.5.3.2** Closed guard-bar method

As in Sections 4.5.3.1.1 – 4.5.3.1.7 above except that the product return guard-bar is closed during product transfer/return.

#### 4.5.4 Recommended tests

4.5.4.1 Check that a normal delivery is halted and a ticket is printed if the product transfer master control switch is pulled.

4.5.4.2 Check the security features and interlocks above, as appropriate.

4.5.4.3 Open guard-bar method - Check that the product transfer guard bar cannot be closed and locked with the hose attached to the product transfer connector.

4.5.4.4 Closed guard-bar method - Check that the product transfer guard bar cannot be opened and the hose removed from the product transfer connector.

4.5.4.5 Check that the volume of product transferred/returned will not be printed onto a ticket when used for trade immediately after a product transfer/return

#### 4.5.5 Conditions

The product return system described in Sections 2.2 and 3 is not authorised for use in new tankers entering service after 29 February 2000. The system described above in this amendment must be used instead.

4.6 As described in the certificate but having an alternative flow meter, the ALMA turbine meter model Adriane DN 50-50.

#### 4.7 Utilisation of the LC-98 Temperature compensation

4.7.1 Having the LC-98 litre counter as described in Certificate Number 2797/4, but having the temperature compensation function enabled.

#### 4.7.2 Conditions

4.7.2.1 A Type PT100 temperature probe is mounted within 1m of the flow meter inlet port. This should be sealed securely. The wiring loom is modified to connect the PT100 probe to the LC98 Electronic register.

4.7.2.2 Software to be upgraded to include Temperature Compensation option. Temperature Compensation can be applied to two main product groups: Diesel/Gas Oil and Kerosene/Paraffin. The applicable software versions are 50208-124 (or later) or 50260-112 (or later)

4.7.2.3 When Temperature Compensation option is selected, at the end of the delivery the lower scrolling prompt display on the register will flash:

– *Temperature Compensated Volume.*

Additionally the delivery ticket will have printed on it:

“*Temperature Compensated Delivery to 15°C*”.

## 5 RECOMMENDED TESTS

In addition to the tests specified in Regulations the following may be performed to ensure conformity to the pattern:



**5.1** Check that the system detects the absence of paper in the printer.

**5.2** Check that if more than one receipt per transaction is printed the second and subsequent ones are marked as duplicates.

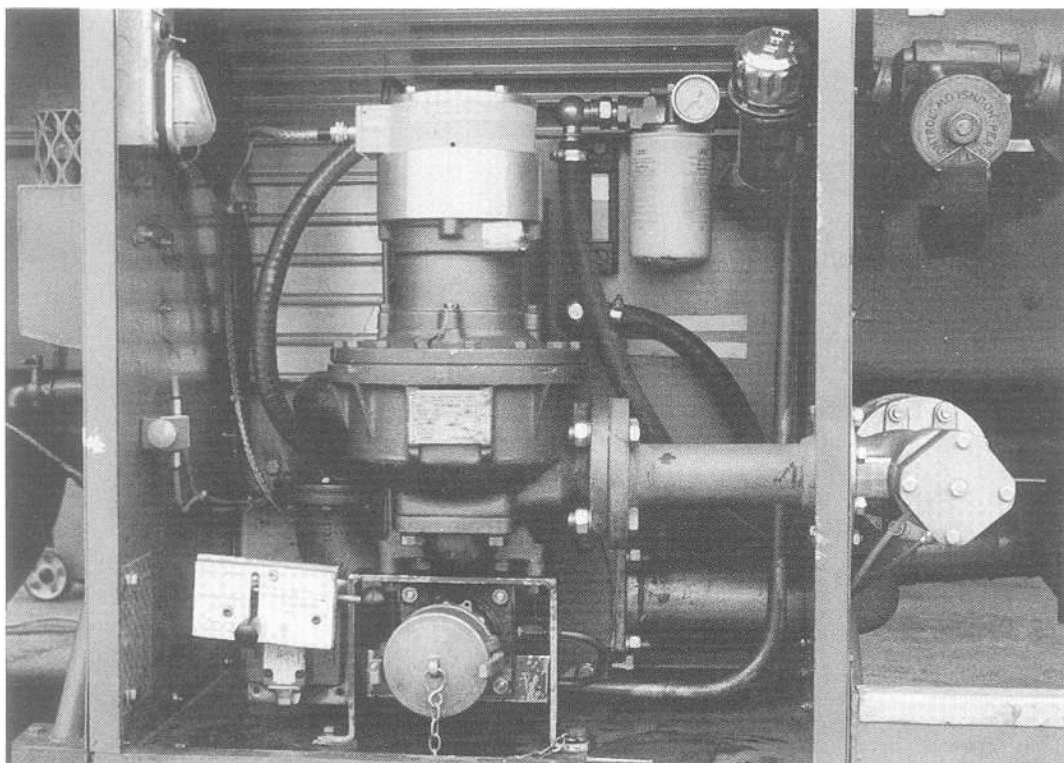
**5.3** Check that if the vehicle battery is isolated the litre counter/control box display retains transaction data.

## **6 CERTIFICATE HISTORY**

<b>ISSUE NO.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
2797	1 October 2006	Type examination certificate first issued.
2797 Revision 1	30 October 2009	Section 4.6 added, ALMA turbine meter Section 6 added, Certificate History
2797 Revision 2	03 December 2010	Section 4.7 added, Utilisation of the LC-98 Temperature compensation



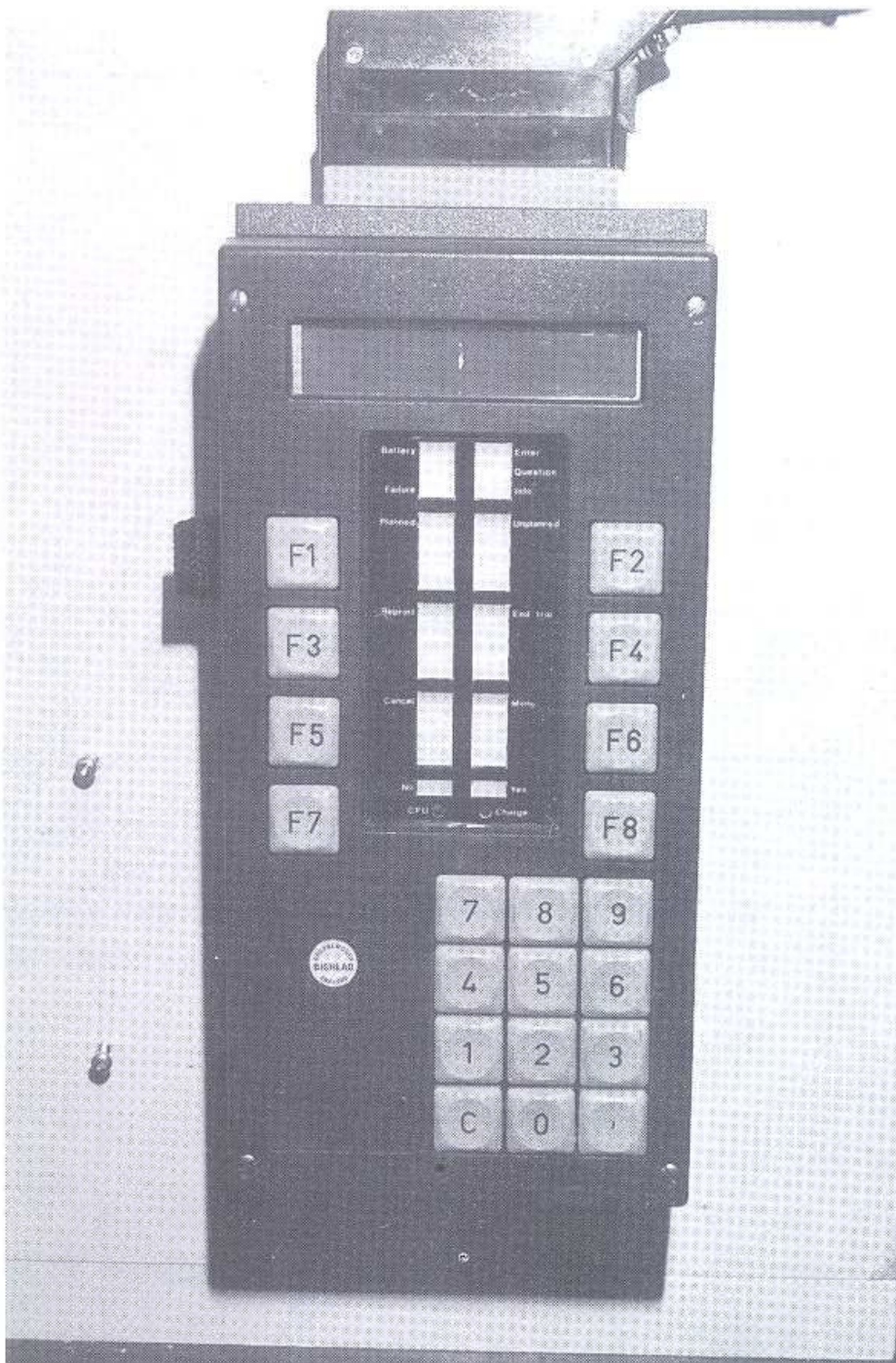
**Figure 1 Side view of tanker showing meter box and litre counter/control box**



**Figure 2 Meter with pulser**



**Figure 3** Litre counter/control box



**Figure 4 Input device (Portamat)**

POINT OF SALE SYSTEM. TEST EXAMPLE 1989 Okt. 3.

WILSONS FUELS LTD  
GLENSHELLACH TERRACE  
OBAN 050002  
ARGYLL  
VAT REG. NO. 888 6543 22

AD VEHICLE NO. MOD TOE DATE/TAX POINT  
8967 89/09/04

DELIVERED TO NO 22222222  
Mr. Customer 2  
John Jones  
102 Non Existent Street  
Somewhere Else

FUEL OIL STANDARD.....					
QUANTITY	PROD CODE	PENCE/L	TOTAL	EX. TAX	LINETOTAL (1)
500.1 L	7510	33.50	£	167.53	£ 167.53

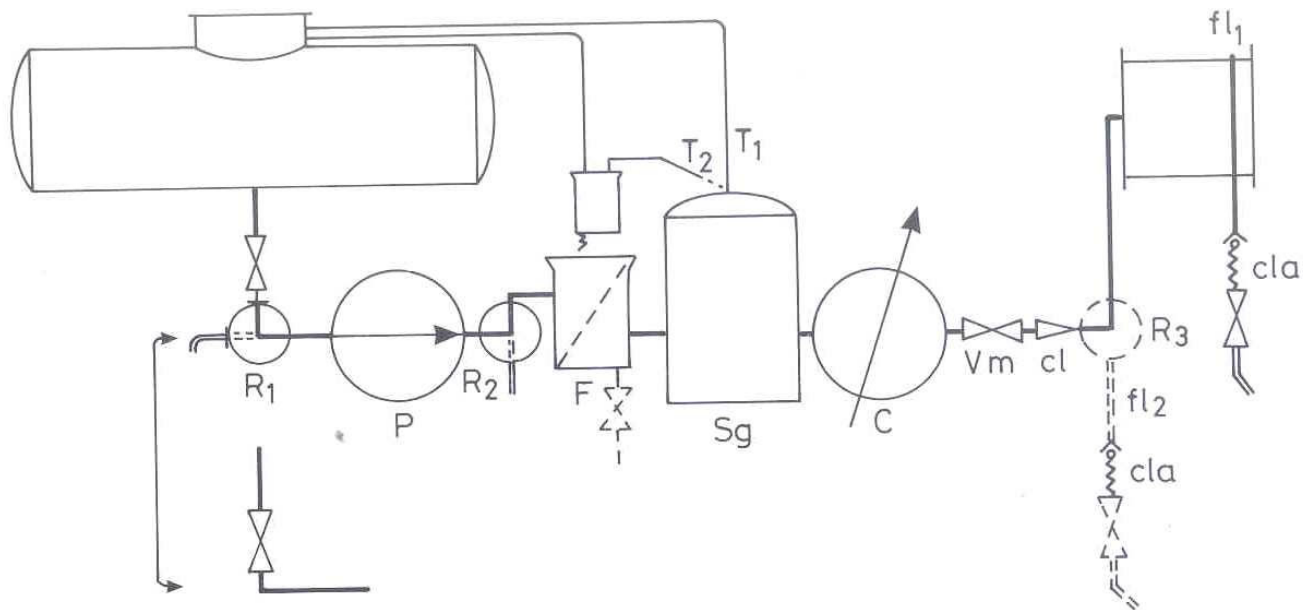
FUEL OIL SUPER TYPE 1.....					
QUANTITY	PROD CODE	PENCE/L	TOTAL	EX. TAX	LINETOTAL (2)
299.9 L	7520	39.50	£	118.46	£ 118.46

-----  
TOTAL : £ 285.99  
VAT TOTAL (22.00%): £ 62.91+  
INVOICE TOTAL : £ 348.91  
=====


SEQ-NO: 2 START:00120698 STOP:00121198 LC-NO: 2 DLY-STATUS: 1  
SEQ-NO: 3 START:00121198 STOP:00121498 LC-NO: 2 DLY-STATUS: 1

TOTAL QUANTITY: 800.0 L

**Figure 5 Receipt**

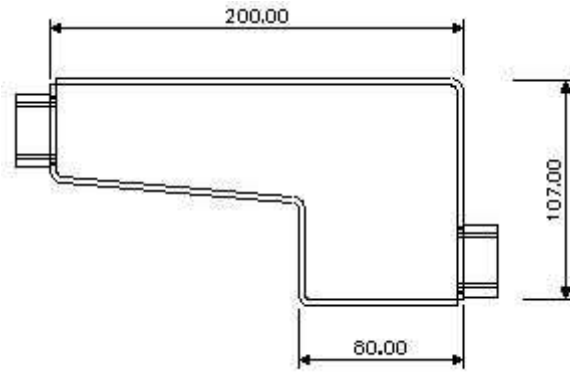


**Figure 6 Hydraulic system diagram**

NAME AND ADDRESS OF TANKER BUILDER			
METER MEASURING SYSTEM			
SYSTEM	50mm		UK
SERIAL No			C2797
DATE OF MANUFACTURE			
FLOW	MAX	MIN	LITRES/MIN
MAXIMUM PRESSURE			BAR
MINIMUM DELIVERY			LITRES
LIQUIDS MEASURED	GAS OIL;DERV;KEROSENE;GR1;PARAFFIN		

**Figure 7 Data plate**

(N.B. the certificate number should read C2797 under this approval)



**Figure 8 Expansion tank (section view)**