NMO

2286/80

III(5)a

Pursuant to section 12 of the Weights and Measures Act 1985

Certificate No 2286/80 Revision 3

Issued by:

NMO

In accordance with the provisions of section 12 of the Weights and Measures Act 1985, the Secretary of State for the Department for Business, Energy & Industrial Strategy has issued this UK national type-approval certificate to:

Tokheim UK Ltd
Unit 3
Baker Road
West Pitkerro Industrial Estate
Dundee, DD5 3RT
United Kingdom

And hereby certifies as suitable for use for trade the following pattern of a liquid flowmeter as described in the descriptive annex to this Certificate, and having the following characteristics:-

DISPENSER: Tokheim Elite dispenser as described in the descriptive annex.

POINT OF SALE SYSTEMS: As described in the associated certificates 2286/59.

Under the provisions of section 12(6) of the said Act, the validity of this certificate is limited as shown below.

Under the provisions of section 12(5) of the said Act, this certificate is subject to the conditions described in the descriptive annex.

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.

This revision replaces previous versions of the certificate.

Issue Date: **17 August 2016**
Valid Until: **26 October 2016**

G Stones
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For and on behalf of the Head of Certification Body

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Descriptive Annex

1 INTRODUCTION

This pattern of an electrically driven meter comprises a dispensing unit operating in attended stand-alone mode. It was originally manufactured by Schlumberger RPS Dunclare and designated the Elite. It is now manufactured by Tokheim with several designations as listed in this descriptive annex. The transaction data for each side is shown on the display and computing head. The dispenser can indicate up to 999.99 litres giving an indication every 0.01 litres. The price-to-pay indication indicates up to £999.99 in intervals of £0.01. The unit price increments every 0.1 pence per litre up to a maximum of 999.9 pence per litre.

The dispenser is of a modular design, with the master module comprising the electronics and display head supported by a column as well as a hydraulic unit and hose retractor assembly. The hydraulic unit is manufactured by Tatsuno and comprises a motor driven pumping unit with integral air separator feeding two meters. The slave module comprises a hydraulic unit and hose retractor assembly.

There may be up to four slave modules supported by the master module. This allows up to five nozzles on each side of the dispensing unit. Electrical interlocks permit the use of only one nozzle on a particular side of the dispenser at any one time. Any single nozzle may be used on the opposite side of the dispenser at the same time.

This pattern is suitable for liquids other than water of low viscosity (<20mPa.s) except liquefied gases. This includes ethanol blends up to 100% ethanol.

2 CONSTRUCTION

2.1 Mechanical (Figure 1)

The dispensing units are assembled using two types of hydraulics housings. These are a master module and slave module, both of which contain the same hydraulic units, cabling and hose retraction assemblies. In addition, the master module has a short column upon which is situated the electronic calculator and display. Structural assemblies and paneiwork are constructed in steel.

Approximate Dimensions:-

Master module:	1565 mm high	510 mm wide	470 mm long
Slave module:	1,140 mm high	510 mm wide	470 mm long

2.2 Hydraulics (Figure 2)

The hydraulic unit comprises a motor driven pumping unit feeding two meters, and associated air separators, non-return and pressure relief valves. The meter output pipes are routed via solenoid valves to the hose retraction assemblies. There can be up to five such hydraulic arrangements per dispensing unit.

2.2.1 Combined pump and air separator

The pumping unit is belt driven from an electric motor and has an integral air separator. The pumping unit is manufactured by Tatsuno, and is designated the PGS-0257-H. This high speed pumping unit is connected to two meters. The delivery rate is 45 L/min at each nozzle.

Fuel is drawn in via the inlet and passes through the strainer into the rotary pump. A by-pass valve circulates liquid returning at a predetermined pressure to the pump inlet. Fuel passes through the air separator where any air present is allowed to pass to the float chamber. The float chamber houses a float operated valve that permits excess liquid to be returned to the suction side of the pump. air is vented from the float chamber to the atmosphere via an overflow protection valve. Liquid in the outlet chamber leaves the pumping unit via a check valve.

2.2.2 Meter

The meter, designated type 02515-J, is a four-piston positive displacement type. The body of the meter is made from aluminium alloy and the cylinders have stainless steel liners. Calibration is by adjusting the stroke using an adjusting handle. This handle has a through hole to accept sealing wire. The meter shaft rotates twice for every litre of fuel delivered.

2.2.3 Pipework

A pipe from each meter is routed via a solenoid valve to the hose retractor assembly. Each pipe is then fixed to its respective hose, the hose terminating in a nozzle. Nozzles are stowed in holsters along the sides of the hydraulics module.

2.2.4 Solenoid valve

A single-stage solenoid valve is fitted on the discharge side of each meter. When energised the valve allows full flow of the liquid to the selected nozzle.

2.2.5 Nozzles

The following nozzles may be used:

Manufacturer	Model/Description	Type
Elaflex	ZVA 4.4R for use with unleaded petrol	Automatic Shut-off
Elaflex	ZVA 4.4 for use with leaded petrol and diesel	Automatic Shut-off
Elaflex	ZVA 25.41 high flow nozzle for diesel	Automatic Shut-off
Elaflex	ZVA Slimline Drip Stop nozzle Minimum Delivery 5 litres. (A legend indicating a 5 litre minimum delivery will be marked on the spout of the nozzle, this marking overrides that marked on the dispenser).	Automatic Shut-off
Elaflex	ZVA Slimline 2	Automatic Shut-off
Elaflex	ZVA X204 GRV3G for use with unleaded petrol	Vapour Recovery
Elaflex	ZVA X204 GRV3R-BL for use with leaded petrol	Vapour Recovery
Elaflex	ZVA X204M GRVP	Vapour Recovery
Elaflex	ZVA Slimline 2 GR	Vapour Recovery

Manufacturer	Model/Description	Type
Husky	Type 'X' series, single and double poppet designs. Optional accessories including swivel joints, sight glass option, and alternative spouts and splash guards which may be fitted as required.	Automatic Shut-off
Goodyear	GTR 50 for flowrates up to 50 litres /minute	Automatic Shut-off
Goodyear	GTR 80 for flowrates up to 80 litres /minute	Automatic Shut-off
Goodyear	GTR 120 for flowrates up to 120 litres /minute	Automatic Shut-off
Goodyear	GTR 50 VR	Vapour Recovery
OPW	11 VAIE-0035 for use with unleaded petrol 11 VAIE-0037 is for leaded fuel.	Vapour Recovery
OPW	11 VAIE-0037 for use with leaded petrol	Vapour Recovery
OPW	12 EN (may be fitted with different sizes of spout depending on the product type)	Automatic Shut-off
OPW	12 EN V (may be fitted with different sizes of spout depending on the product type)	Vapour Recovery
ABR	ABR 50 VR	Vapour Recovery
Nozzle Eng	Electronic Nozzle	Automatic Shut-off
DOT ONE	DOT ONE 300	Automatic Shut-off
DOT ONE	DOT ONE 500	Automatic Shut-off

2.2.6 Hoses

The following hoses may be used:

Manufacturer	Model	Maximum length (Metres)
Elaflex, Germany	Conti – Slimline 25 Low temperature	6
Elaflex, Germany	Conti – Slimline 21 Low temperature	10
Elaflex, Germany	Conti – Slimline 16 Low temperature	13
Elaflex, Germany	Conti – Slimline 21 MPD	7
Good Year, USA	EN1360 TYPE 3 25mm 16 BAR M 1Q00 0310	15
Good Year, USA	EN1360 TYPE 3 16mm 16 BAR M 1Q99 0749	15
Good Year, USA	¾"Hardwall Petrol Hose	15

2.3 Electrical

2.3.1 Motor

The motors that drive the rotary pumps are single-phase or 3 phase, 1 HP rated.

2.4 Electronics

2.4.1 Pulser

On each meter output shaft is fitted a pulser which converts the rotary movement of the shaft to electrical pulses. The pulser is a dual channel opto-electronic type that produces 200 pulses per litre. The pulser is manufactured by Eltomatic and is designated type 0109. Also. a flexible cable drive is coupled to a mechanical totaliser.

2.4.2 Display Head

The display head is supported from a column on the master module and contains the electronic calculator, displays, power supply and motor switching circuits. These are all housed in a fibreglass enclosure with a window in each side. Illumination is by fluorescent tubes.

2.4.3 Electronic calculator

The electronic calculator known as CoCa and comprises the following modules:

Uninterruptible power supply (UPS) with external batteries	Maintains displays and transaction information during power failure.
Calculator control module	Controls the hydraulic units and communicates with kiosk equipment (if connected).
User interface module	Contains the transaction displays.
High voltage module	Interfaces to nozzle and motor switches.
Infra-red remote control module	In stand-alone mode this module allows dispenser parameters to be set; unit prices etc.

2.4.4 Transaction displays

The dispensing unit contains two display boards, one on each side of the display head. The board contains 7-segment Ferranti Packard electro-mechanical displays for price-to-pay (5 digit), volume (5-digit), and pence per litre (4 digit). Grade indication is by means of a LED next to the appropriate grade indication legend.

2.4.5 Infra-red remote control (Figure 3)

When in stand-alone mode the dispenser configuration, unit prices etc. can be programmed by means of the infra-red remote control. A key switch is located on the underside of the display head. This key must be operated and a PIN code entered, via the remote control, before any programming can be achieved.

If programming is attempted during a delivery ignores any instructions from the remote control unit and continues as normal. Unit price changes are not possible whilst a delivery is in progress.

2.4.6 Peripheral connection

Interfacing to peripheral equipment is provided via an RS232 port and to the kiosk control equipment via a current loop.

2.5 Displays and legends (Figure 4)

The legends on the display face are given in the following table:

LEGEND	CHARACTER HEIGHT
£	18mm
This Sale	15 mm
Litres	15 mm
Pence per litre	5 mm
See that indicator is at zero before delivery commences	5 mm
Minimum delivery 2 litres	5 mm

Legends associated with grade indication are 5 mm high and there is an illuminated pump number 80 mm high. Additionally, there may be the following typical instructions adjacent to the display face:

1 Remove fuel tank filler cap
2 Place nozzle in fuel tank
3 Squeeze trigger until required quantity is indicated or delivery stops automatically
4 Replace nozzle in holster
5 Replace fuel tank filler cap
6 Check indication and pay cashier.

2.6 Sealing (Figure 5)

2.6.1 Meter

The meter is sealed by means of a wire passed through a hole in the rim of the calibration wheel, a hole in the locking pin and a hole in the head of a bolt securing the cover of the calibrating cylinder. A wire passes through two bolt heads in each cylinder cover, one bolt head in both the top and bottom meter covers and a hole in the dispenser frame.

2.6.2 Pulser

An adapter is fitted between the meter output shaft and the pulser shaft. A screw fixes the adapter to the meter shaft and a further screw fixes the adapter to the pulser shaft. Each screw head has a hole through which a sealing wire is passed, drawn taut, and then sealed.

3 OPERATION

3.1 Controls and features

On the underside of the computing and display head is a key switch. The operation of this key switch allows the infra-red remote control access to the management programming mode once a PIN number has been entered via the remote control.

3.2 Operating sequence

At the start of the transaction, the dispenser displays the previous sale. The attendant removes the nozzle corresponding to the grade required on the side of the dispenser at which he is standing. The displays show all 8s, blanks then zero. The grade selected and corresponding unit price is displayed and the appropriate motor is started permitting a delivery to commence.

A second nozzle may be used on the other side of the dispensing unit. At the end of the delivery the nozzle is replaced in the nozzle holster and the pump motor stops.

3.3 Interlocks and security features The following interlocks are provided:-

(i) Only one grade can be selected at any one time and cannot be changed after a delivery of 0.05 litres has occurred.

(ii) The delivery is stopped if the pump detects an error condition.

In the event of a mains power failure, displays on the dispenser are maintained.

(iv) A period of 5 seconds must elapse before a delivery of fuel can be authorised following the replacement of the nozzle in the previous transaction.

(v) The unit price cannot be changed after any operation has been made on the dispenser to initiate a transaction and before the expiry of the 5 second guard time (as iv).

The remote control cannot access the programming mode unless the key switch has been operated and a PIN code is entered via the remote control, Access to the programming mode is not possible during a transaction.

(vii) It is not possible to enter a unit price below 32.4 pence per litre.

4 AUTHORISED ALTERNATIVES

4.1 Alternative Enclosure Arrangements

4.1.1 Having the dispensing unit, described in the certificate, with one, up to a maximum of ten, hose(s) and associated nozzle(s). The hose arrangement may be with an equal or unequal number of hoses on each side.

4.1.2 Having nozzles and displays fitted to one side of the dispenser only, in which case the appropriate meters, encoders and valves are removed from the unit and that side of the display case is blanked.

4.1.3 Having a single-product, single-hose high speed version. where the Tatsuno hydraulic unit described at Section 2.2 feeds one meter only. The hydraulic unit is contained within the master module.

4.1.4 Having a single-product two-hose high speed version, where the Tatsuno hydraulic unit described at Section 2.2 feeds one meter only. The master module contains one hydraulic unit and the hose assembly. The other hydraulic unit is contained within a slave module which has no hose assembly

4.1.5 Having the single-phase motor described at Section 2.3 replaced by a 3-phase motor.

4.1.6 Having the mechanical totalisers removed from the pullers.

4.1.7 Having submerged or remote hydraulics, in which case the motors and pumping units are removed from the hydraulic enclosure. However, the meter described at Section 2.2.2 will remain within the enclosure.

4.1.8 Having the grade indication removed.

4.1.9 Having two dispensing units in a satellite configuration, the satellite unit housing is as described in the Certificate. However, the unit contains no hydraulic components other than a single stage solenoid valve and retractable hose unit.

4.1.10 Having a dispenser that is capable of delivering at two flow rates. The higher flow rate is approximately 80L/min and the slow flow rate is approximately 40 L/min.

4.1.11 Having fitted to the dispenser push-buttons that allow the purchaser to preset by either volume or price a specific delivery amount. There are two buttons that select the required volume or price. These buttons may have any value and each operation increments the preset amount by their respective values. A third `CLEAR ALL' button is included which cancels the total preset amount and allows another to be entered. This button is only operational up to the point of lifting the nozzle.

4.1.12 Having a volume only display.

4.1.13 Having a separate delivery system fitted for delivering non-fuel products such as adblue.

4.2 Alternative Enclosure Styles

4.2.1 2000 Range

As described in the Certificate but having the Range 2000 dispenser housing as shown in Figure 6. The display head is enlarged and mounted on top of heightened hose retraction units, which are all mounted adjacent to each other. An additional smaller hydraulic housing is positioned on the opposite side of the hose retraction units in configurations of 4. 6. 8 and 10 hose dispensing units.

4.2.2 Level 5

As described in the Certificate but having the Level 5 dispenser housing as shown in Figure 7. The display head is mounted on one of the support columns for the hose canopy.

4.2.3 Industrial Cladding

Having the enclosure modified as shown at Figure 8. The cladding may be manufactured of glass fibre or metal.

4.2.4 Pegasus

As described in the certificate but having the Pegasus housing as shown in Figure 9

4.2.5 Optima

As described in the Certificate but having the Optima dispenser housing as shown in Figure 10. The calculator housing on Optima has an outside cladding of steel and is in halves. Each of which may be opened for access to the calculator, An additional smaller hydraulic housing is positioned on the opposite side of the hose retraction units in some configurations of hose dispensing units.

4.2.6 Quantium 100, 300 and 500

As described in the Certificate but having a range of dispenser housings under the generic name of Quantium. These are built using the same standard sub assemblies but with different hose and product combinations.

4.2.6.1 Quantium 100 (Figure 11)

The calculator housing of the Quantium 100 is situated between two columns 340mm above the hydraulic housing. The dispenser columns and hydraulic housing are steel sheet punched and folded into modular units. Hoses are hung from either, spring actuated rope retraction units, or stowed on a simple hook. Nozzle holders are in the columns (island) configuration.

4.2.6.2 Quantium 300 (Figure 12)

The calculator housing of the Quantium 300 is situated between two columns 340mm above the hydraulic housing. The dispenser columns and hydraulic housing are steel sheet punched and folded into modular units. Hoses are hung from either fixed or flexible hose masts. The nozzle holders may be either in the hydraulic housing doors or in the columns.

4.2.6.3 Quantium 500 (Figures 13)

The calculator housing of the Quantium 500 is situated partially on the hose cassettes and on a blanking unit for a future card reader, adjacent to the calculator housing is a space fill unit for advertising. The card reader is situated above the hydraulic housing containing the solenoid housing, this housing is situated above an extended hydraulic housing that is adjacent to the cassettes.

4.2.7 Quantium 300T, 400T and 500T

As described in the certificate but having a range of dispenser housings under the generic name of Quantium T. These are built using the same standard sub assemblies but with different hose and product combinations.

4.2.7.1 Quantium 300T model (Figure 14)

Having the Quantium 300 dispenser as described above modified with minor dimensional and cosmetic changes. This is primarily a change in footprint from 750mm x 500mm to 830mm x 520mm. The model is identified as the Quantium 300T.

Materials are similar to those used on the existing Quantium 300 model. The majority of cladding panels, including the calculator housing and doors, are constructed from mild steel. The use of plastic components for external panels is limited to the nozzle boots, as used on the existing Quantium 300 and 500 models.

4.2.7.2 Quantium 400T model (Figure 15)

Having the Pegasus model as described above identified as the Quantium 400T. The model may optionally use the plastic nozzle boots of the Quantium 300T or 500T.

An integrated payment terminal may be installed providing this certificate has approved its use.

4.2.7.3 Quantium 500T model (Figure 16)

Having the Quantium 500 dispenser as described above modified with minor dimensional and cosmetic changes. This is primarily a 100mm increase in height of the hydraulic housing, and single product models no longer include a 'dummy' hose retractor along side the populated hose retractor. The model is identified as the Quantium 500T.

Materials are similar to those used on the existing Quantium 500 model. The majority of cladding panels, including the calculator housing and doors, are constructed from mild steel. The use of plastic components for external panels is limited to the nozzle boots, as used on the existing Quantium 300 and 500 models.

An integrated payment terminal may be installed providing this certificate has approved its use.

4.2.8 Quantum 100T and 200T

As described in the certificate but having two alternative enclosures for the hydraulics and calculator used on the Quantium 300T dispenser as described above. These two alternative enclosures are named the Quantium l00T and Quantium 200T, and are built using the same standard sub assemblies but with different hose and product combinations.

4.2.8.1 Quantium 100T model (Figure 17)

Models may only dispense a single product. Models may have displays for Price to pay, Volume. and Unit price, or models are available with a Volume only display. The display is mounted on one side of the dispenser only

4.2.8.2 Quantium 200T model (Figure 18)

Models may dispense one or two products through individual hoses. All mode1s are designed for retail use with displays for Price to pay, Volume, and Unit price. Displays may be mounted on one side of the dispenser or both.

4.2.9 Quantium 200T twin series dispenser with hydraulics for removing fuel from vehicle fuel tanks (De-bowser unit)

As described in the Certificate but having the hydraulics serving one side of the dispenser replaced with hydraulics for withdrawing fuel from vehicle fuel tanks. The pulser and associated electronics in the headworks remain unaltered. The hydraulic arrangement is shown in Figure 19.

NOTE: The de-bowser section is not approved for trade use but is intended for wetstock reconciliation purposes only. A label is fixed to this section that clearly displays the following text:

FOR WITHDRAWING FUEL ONLY. NOT FOR TRADE USE

The hydraulic components of the dispenser and the de-bowser are separate with the de-bowser display showing volume only.

The dispenser may only be operated in a self contained mode or with self-service devices approved for registered users only.

4.2.10 Quantium 410

As described in the certificate, but having an alternative dispenser enclosure designated Quantium 410 (Figure 20). This is similar to the Quantium 400T model described above; but having the electronics enclosure supported between the dispenser columns, and an airspace between the top of the hydraulic housing and the underside of the electronics enclosure. The upper halves of the dispenser columns may include a hose retraction mechanism. A payment terminal enclosure may be fitted to the underside of the main calculator enclosure.

4.2.11 Quantium 510

As described in the certificate, but having an alternative electronics enclosure for the Quantium 510 model (Figure 21). The dispenser is visually similar to the Quantium 500T model described above; but having a larger electronics enclosure, which extends down to the height of the hydraulic top housing. The upper door to the enclosure supports the primary display and an optional separate video display, which may be used for non-metrological purposes such as advertising. A payment terminal enclosure may be fitted to the underside of the main calculator enclosure.

4.2.12 Quantium 510C

As described in the certificate but having , but having an alternative arrangement for the hose management system and electronics enclosure as shown in figure 22. The dispenser is similar to the Q500T as described above, using the same style of hydraulics cabinet, hydraulic components and calculator. The hose management cassette uses a single vertical column instead of smaller multiple individual hose cassettes. The grades are separated using partitions fitted external to the single hose cassette column.

The electronics enclosure is located within a safe area above the hydraulics cabinet, on the end column of the hose management cassette. Any approved payment terminal under 2286 may be fitted as an option. The type designation may be known as Quantium 510C, Q510C, Q510n where n is an alphanumeric character used to reflect particular key features such as the hose management cassette or style of electronics enclosure.

5 ALTERNATIVE HYDRAULICS

5.1 Alternative Schlumberger hydraulics (Figure 23)

As described in the Certificate but having all the Tatsuno hydraulic units replaced by Schlumberger PAS hydraulic units. This hydraulic unit comprises a motor driven pumping unit. with integral air separator and gas detector. feeding two meters and associated nozzles. The maximum flowrate is approximately 55 litres per minute.

5.1.1 Pumping unit

Fuel is drawn in via a filter. through a check valve, into the rotary gear pump and then passes through an air separating vortex. Fuel with a small amount of entrapped air then passes to the main air separation chamber. Any remaining air is vented to atmosphere via an air vent check valve and fuel is passed to the nozzle.

If the amount of air entrapped in the fuel passing through the pumping unit is greater than a predetermined value the gas detector operates and causes the fuel flow to cease.
This pumping unit may be fitted in conjunction with any meter described in this certificate.

5.1.2 Meter

The Schlumberger SMIOO meter consists of two pistons which move horizontally and transmit their movement to the pulser by means of crank pins. The meter adjustment is made by adjusting the stroke of the pistons at one end. The meter adjustment wheels are covered and sealed. The meter has a drive ratio of two revolutions per litre.

5.1.3 Pulser

As described in section 2.6.2.

5.1.4 Sealing (Figure 24)

5.1.4.1 Meter

The meter is sealed by means of a wire which passes through a loop in the serial plate, then through a hole on the top cover and through concentric holes on the meter body and back cover. It then passes through a hole in the meter body, a hole in the bottom cover. to the other side of the meter and passes back to the loop in the serial plate. via a similar route described above. and is then drawn taught and sealed.

A second wire passes through a screw on the cover of the calibration wheel and then through a hole in the cover itself. It is then drawn taught and sealed.

The meter and pulser assembly are also sealed to a horizontal plate. A wire passes through all the assembly fixing screws and a separate screw fixed to the plate. it is then drawn taught and sealed.

5.1.4.2 Pulser

The pulser is sealed by means of a wire which passes through a special seal screw securing the top and bottom covers of the pulser and then through a screw which is fastened to the bottom cover of the pulser only. It is then drawn taught and sealed.

5.1.4.3 Alternative Sealing

Having the meter and pulser sealed by means of a wire routed as shown in figure 25 drawn taught and sealed.

The sealing as shown should be such that, as well as sealing the individual components, it is not possible to remove them from the dispenser frame without breaking a sealing wire.

5.1.3 Authorised Alternatives

5.1.3.1 Having a single meter being fed by a pumping unit described at section 5.1.1. This high speed single hose version has a maximum flowrate of approximately 80 litres per minute. The remaining of the hydraulic unit is as described in this amendment.

5.1.3.2 Having the gas detector device removed from the pumping unit described at section 5.1.1

5.1.3.3 Having the PAS 130 pumping unit with max flow of 80 litres a minute.

5.1.3.4 Having the-PAS 130/8 pumping unit with a max flow of 130 litres per minute

5.2 Alternative Tokheim hydraulic unit PAS V3

As described in the Certificate but replacing the existing hydraulics with the Tokheim PAS V3 hydraulic unit that can be configured with different combinations of meters and nozzles to give different maximum flow rates (Qmax). A typical arrangement within the alternative Pegasus enclosure is shown in Figure 26.

5.2.1 Pumping unit

This unit comprises a motor driven pumping unit, with integral air separator and associated non-return and pressure relief valves, feeding one or two meters, directly mounted horizontally on the pumping unit. The complete assembly can be identified by the ‘sticker’, as shown in Figure 27, attached to the body of the pumping unit.

5.2.1.1 Standard delivery rate (Qmax 40 L/min)

For the standard delivery rate the pumping unit is connected to two meters each feeding one hose and nozzle at a maximum flow rate of 40 litres per minute. This configuration is suitable for use with petrol and diesel.

5.2.1.2 High speed delivery rate (Qmax 80 L/min)

For the high speed delivery rate the pumping unit is connected to one meter feeding one hose and nozzle at a maximum flow rate of 80 litres per minute. This configuration is suitable for use with petrol and diesel.

5.2.1.3 Super high speed delivery rate (Qmax 130 L/min)

For the super high speed delivery rate the pumping unit is connected to two meters feeding one hose and nozzle at a maximum flow rate of 130 litres per minute. This configuration is suitable for use with diesel only. The minimum delivery is 5 litres.

5.2.2 Sealing (Figure 28)

The meter is sealed by means of a wire, which passes through tabs and cast bosses on the sheet metal and cast components of the pump meter and pulser.

I. Pulser; A seal wire passes through two sets of aligned holes in the body and lid of the pulser. The holes are in diagonally opposite corners of unit and the seal is made close to one of the corners.

II & III. Meter; The wire first threads through the lead seal then to a hole in the bell housing flange of the meter on to a tab with hole on the pulser gear retaining plate, round to the back plate of the meter through aligned holes in the meter body and back plate. The wire now passes through two similarly positioned holes in two corners of the bottom plate then returns via another hole in the back plate to bell housing and on to a second tab/hole in the pulser gear plate, and finally to the lead seal.

IV. Calibration wheels, and meter to dispenser; A wire is passed from the seal through a hole in the calibration cover then the cover securing screw to a hole in the pumping unit top and back to the seal.

V. Blanked pump port (where only one meter is installed) A wire is passed through holes in the nut end of the two securing bolts preventing their removal or rotation. The seal is made between the two bolts.

All seal wires are drawn taut through all the holes prior to sealing

5.2.3 Authorised Alternatives

Having the PAS V3 combined pump and air separator unit described but having a modified vortex valve and outlet non-return valve. This is identified by a data plate that references OIML certificate number “OIML R117-95-NL-01.04”.

5.3 Alternative Tokheim combined pump and air separator unit EPZ (Figure 29)

Having the dispensers as described in the Certificate but replacing the existing pump and air separator unit with the Tokheim EPZ pump and air separator unit. This can be configured with different combinations of meters and nozzles to give different maximum flow rates (Qmax)

5.3.1 Construction

This unit comprises a combined rotary pump and air separator known as the model EPZ. Fuel is drawn into the pump via an inlet strainer, and through a checkvalve prior to entering the pumping section. The pump is based upon a rotary vane device, and the unit includes a bypass circuit controlled by a mechanical spring valve. Within the pump discharge circuit, all fuel passes under pressure through a centripetal air separator, and finally through a non-return valve to the discharge port.

Separated air is vented to atmosphere via the air vent, and any liquid is returned to the inlet side of the pump via a float valve within the air separation chamber.

5.3.2 Standard delivery rate (Qmax 40 L/min)

For the standard delivery rate the pumping unit is connected to two meters each feeding one hose and nozzle at a maximum flow rate of 40 litres per minute. This configuration is suitable for use with petrol and diesel.

5.3.3 High speed delivery rate (Qmax 80 L/min)

For the high-speed delivery rate the pumping unit is connected to one meter feeding one hose and nozzle at a maximum flow rate of 80 litres per minute. This configuration is suitable for use with petrol and diesel.

5.4 Alternative Tokheim Meter MA26 and Pulser MP-T1 (Figure 30)

Having the dispensers as described in the Certificate but having the Tokheim Meter MA26 and the Pulser MP-T1 combination fitted to the Tokheim PAS V3 or the EPZ or PAS 130 pump and air separator units

5.4.1 Meter

The meter is the Tokheim model MA26. This is a positive displacement device with four horizontal pistons. The meter output shaft, which rotates once very 0,7 litres, is directly connected to the pulser model MP-T1. Calibration is provided by moving a lever on a notched quadrant at the base of the meter, which adjusts a cam acting on the four pistons. Each step is approximately 0.1%.

5.4.2 Pulser

The pulser is a Tokheim type MP-T1, which generates 100 pulses per litre. This is bolted to the meter and directly couples to the meter output shaft. This is similar to the MP1 pulser used with the SM80 meter described in certificate 2286/13 but the gearing is modified to output 70 pulses per revolution and to account for the MA26 meter rotating in the reverse direction to the SM80 meter.

5.4.3 Sealing

1 Piston sealing

A sealing wire feeds through the head of a seal screw fitted in each piston end cover. This seal wire also diverts upwards between two of the end covers to feed through a seal screw securing the top housing to the meter body.

The seal wire is drawn taught and a seal fixed for stamp access above the calibration quadrant.

2 Pulser sealing

A sealing wire feed through holes in the bottom right hand corner of the pulser casting and meter housing, then travels diagonally across the front of the pulser to pass through either a hole in the meter mounting plate or the head of the front meter mounting screw.

The seal wire is drawn taught and a seal fixed for stamp access in front of the pulser.

3 Calibration sealing

A seal wire passes through holes in the calibration locking screw drawn taught and a seal fixed.

4 Meter sealing

The meter is sealed into the dispenser by passing a seal wire through the heads of two of the meter mounting screws.
The seal wire is drawn taught and a seal fixed for stamp access on the top of the hydraulic stack.

5.4.3.1 Alternative Sealing of MA26 meter and MP-T1 pulser

The following numbers refer to Figure 31:-

1 Piston sealing

Sealing wire feeds through the head of a sealing screw fitted in each piston end cover. This seal wire also diverts upwards between two of the end covers to feed through a seal screw securing the top housing to the meter body. The seal wire is drawn taught and a seal fixed for stamp access above the calibration quadrant.

2 Pulser sealing

A sealing wire feeds through holes in the bottom right hand corner of the pulser casting and meter housing, then diagonally across the front of the pulser to pass through a hole in the head of the front meter mounting screw. The seal wire is drawn taught and a seal fixed for stamp access in front of the pulser.

3 Calibration sealing

A seal wire passes through holes in the calibration locking screw drawn taught and a seal fixed.

4 Meter to frame sealing

The meter is sealed to the frame of the dispenser by passing the pulser seal wire (described in 2) through the head of the front meter mounting screw.

The following numbers refer to Figure 32:-

1 Meter sealing

The meter is sealed in to the frame of the dispenser by passing a seal wire through the heads of two meter mounting screws then drawing taught and fixing a lead seal.

2 Pulser sealing

A sealing wire passes through two sets of aligned holes in the body and lid of the pulser. The holes are in diagonally opposite corners of the unit and the seal is made close to one of the corners.

3 Housing, piston, and bottom plate sealing

A seal wire passes through a lead seal then through a hole in the meter top housing flange to a tab with a hole on the pulser gear retaining plate, round to the back of the meter through aligned holes in the meter body and back plate. The wire now passes through two similarly positioned holes in two corners of the bottom plate then returns via another hole in the back plate to the meter top housing flange and to a second tab/hole in the pulser gear plate, and finally returns to the lead seal.

4 Calibration sealing

A seal wire passes through the head of the calibration cover securing screw and a hole in the cover, the wire is drawn taught and a lead seal fixed

5.5 Quantium dispenser models with TQP pumping unit and TM80 meter

Having the TQP pump and TM80 meter fitted to the Quantium dispenser models. The dispenser may be renamed in order to highlight the alternative hydraulics being employed as defined in the following table:

Existing Model Name	**Alternative model name with new hydraulics**
Q100T	Q110
Q200T	Q210
Q300T	Q310
Q400T	Q400T (name unchanged)
Q500T	Q510
Q410	Q410 (name unchanged)

5.5.1 TQP pumping unit

As described in the Certificate but having the air separator lid of the EPZ pumping unit reduced in height, and a casting added to the pump outlet port. This casting allows direct connection to one or two meters. The pumping unit is designated TQP.

5.5.2 TM80 meter

As described in the Certificate but having internal modifications to the SM80 meter which reduces drift over the meter lifespan. This meter is designated the TM80 meter.

The TQP pumping unit and TM80 meter are shown in Figure 33

5.6 TQM meter

Having the TQM meter fitted. This meter is similar to the TM80 meter as above but with modifications to the piston seals (Figure 34).

The meter may be used for dispensing traditional petrol and diesel products; but may also be used for dispensing biodiesel blends of up to 20% biodiesel, and ethanol petrol blends of up to 15% ethanol. The aluminium components may optionally be anodised resulting in a dark grey external finish. The meter will typically dispense an 85 % ethanol blend, but may dispense up to 100% ethanol. This is shown on the component label with the added reference, “For use with E85.” This is subject to the bio-fuels not having excessive water content.

With this meter the models may optionally carry the alternative names Q110, Q210, Q310, Q410, and Q510 in order to highlight alternative hydraulics being employed.

6 ALTERNATIVE ELECTRONICS

6.1 Model 6 Alternative Display head electronics

The electronic calculator known as Model 6 comprises the following modules:

a	Battery backed Power supply	-	Power to calculator and displays
b	Computer Board		Controls Hydraulic modules and communicates with Kiosk equipment
c	Multiplexor Board	-	Interfaces nozzles pulsers and solenoids to computer board

6.2 Opto isolator

As described in the certificate, and any compatible variants thereof, but having a Veeder Root single channel opto isolator. The device provides an optically isolated RS232 interface and connects any tank gauging system to any Kiosk Control Unit, or any Point of Sale Terminal approved under this certification for connection to the KCU, or any DOMS controller which is approved under this certification or any compatible variants with an existing RS232 output port and having a current valid until date. The device allows communication of tank related data. The tank gauging system provides the power source for the opto isolator.

This opto isolator is primarily intended for the connection of a tank gauging system. However there may be any peripheral equipment connected to the opto isolator in use for management purposes only. The peripheral equipment must provide the power source for the opto isolator.

The label on the opto isolator bears the part number 700-017-1010, an alternative design of the opto isolator bears the part number 700-017-1011, as shown in Figure 35.

6.3 World Wide Calculator (WWC)

6.3.1 Introduction

Having the dispensers as described in the Certificate but replacing the existing calculator head with the World Wide Calculator.

6.3.2 Construction

6.3.2.1 Calculator (Figure 36)

The electronic calculator known as the WWC comprises of the following:-

a) Power supply unit HVU Identification No: COC OEL 046._

Incorporates rechargeable batteries and maintains display and transaction information during a power failure.

b) Main board HCM Identification No: WWC OEL 001._

Incorporates the calculator module and controls the hydraulic units and communicates with the communication adapter board COM, and the nozzle bus board NBB, both of which are mounted on the main board.

c) Communication adapter COM Identification No: WWC OEL 007._

Interfaces the dispenser operation to self-service equipment.

d) Nozzle switch bus NBB (optional) Identification No: WWC OEL 012._

Interprets the signals from the nozzle switches.

e) Incoming and outgoing board I/O Identification No: WWC OEL 002._

Converts, controls and distributes the signals from the hydraulics unit (pulsers,valves,motors) and communicates with the main board.

f) User access board (optional) Identification No: WWC OEL 005._

In stand-alone mode this allows the dispenser to be set (unit prices etc), using the infra-red handset control unit.

6.3.2.2 Transaction display (Figures 37)

The calculator contains two display boards, one on each side of the display head.
The boards contain 7-segment electro-mechanical or liquid crystal displays for price to pay (5-digits of 25mm height), volume (5-digits of 25mm height), and pence per litre (4-digit of 12mm height).

6.3.2.3 Handset control unit

The dispenser may be set up using either, a remote infrared handset, or a handset, which plugs in to the calculator main board. These handsets are used to set up local configurations, fuel unit prices etc. It is also possible to have readout of totals and errors.

6.3.2.4 Optional LON Interface

Having the Communication adapter COM board "WWC OEL 007" replaced with the LON interface board "WWC OEL 003". This allows communication to approved forecourt control systems using the IFSF protocol.

6.4 World Wide Calculator T1 (WWC–T1)

6.4.1 Introduction

The WWC- T1 differs from the WWC in that the nozzle switch bus board (NBB) is no longer used, the functions of this are now incorporated in the Main board (HCM).
The Main board and the Incoming and outgoing board are now enclosed in a moulded plastic housing which is fixed to the calculator chassis plate.

6.4.2 Construction

6.4.2.1 Calculator (Figures 38 and 39)

The electronic calculator known as the WWC-T1 comprises of the following:-

a) Power supply unit HVU Identification No COC OEL 046._

Incorporates rechargeable batteries and maintains display and transaction information during a power failure.

b) Main board HCM Identification No WWC OEL 001._

Incorporates the calculator module, controls the hydraulic units, interprets the signals from the nozzle switches, and communicates with the communication adapter board COM which is positioned outside the plastic cover and mounted on to the main board through holes in the plastic cover.

c) Communication adapter COM Identification No WWC OEL 007._

Interfaces the dispenser operation to self-service equipment.

d) Incoming and outgoing board I/O Identification No WWC OEL 002._

Converts, controls and distributes the signals from the hydraulics unit (pulsers,valves,motors) and communicates with the main board.

e) User access board (optional) Identification No WWC OEL 005._

In stand-alone mode this allows the dispenser to be set (unit prices etc), using the infra-red handset control unit.

6.4.3 Optional LON Interface

Having the Communication adapter COM board "WWC OEL 007" replaced with the LON interface board "WWC OEL 003". This allows communication to approved forecourt control systems using the IFSF protocol.

6.5 World Wide Calculator 1.1 (WWC–1.1 EIO/EST)

As described for the WWC-T1 but with the following updated components:

6.5.1 Alternative Components

PART	IDENTIFICATION
Basic I/O Board	TQC-EST/TQC 030L0 or TQC EIO4/TQC 001L3
Pre processor module	With EI04 only
ARM9 Processor Board	TQC APB3/TQC 011L3
Hydraulic Module Board	TQC-HYM
Hydraulic Module Board (Cortex based)	TQC-HYM6/TQC 002L6
Display Boards	TQC-CS01-PPU/TQC 027L1 TQC-CSD3/TQC 014L3
VGA Display Devise	iBase M1910E(F) or Avalue EMX-GM45
Slave I/O Board	TQC-S101/TQC006L1
Power Supply Boards	TQC-PSU 2/TQC 005L2 TQC-PSU5/TQC 005L5
Impulse Encoders	TQC-MPL3 TQC-MPC3 TQC-MPC5
IFSF Lon Interface	TQC LON3/TQC 007L3
IFSF LONC Interface	TQC LON4/TQC 007L5
EIN Interface	TQC-008
UDC Interface	TQC-012
Logitron Interface	TQC-009
EPS/Dresser Interface	TQC-EPS1
ZSR/Dunclare	TQC-029
GIL Interface	TQC-031L
PT100 Temperature Sensor	Atexis 909545

6.5.2 Approved Software

6.5.2.1 The ARM-9 software contains 4 legally relevant modules:

Application name	description	version	checksum(s)
IibTqcWM.so	Calculation for "amount = unit price X volume"	00.001.02	00008A76; 0x6340; 0x6350
		01.000.07	Ox77CA
		02.000.07	OxF6FF
		02.001.07	0xF714
		02.003.7	OxF6FD
		03.000.07	0x464D
		04.000.07	0xA392
		05.001.08	0x4E88
		05.002.08	Ox4E4F
		05.006.08	0x214E
		05.008.08	0x2842
		06.001.08	Ox6DA7
		07.005.08	0x33A4
		07.006.08	Ox7F90
DisplayHdl.Arm	Interface to the C5D and VGA Manager	00.001.04	OOOOC316
		00.006.09	OxCB52; Ox5EDC
		00.006.10	0x949A
		00.006.11	0x7B46
		0'1.000.15	OxFD62
		02.000.16	OxFF74
		02.001.16	OxFF8C
		02.003.16	OxFF6E
		03.000.17	Ox2EFF
		04.000.'19	Ox3 E E3
		05.001.23	0x4C86
		05.002.23	0x4B37
		05.006.24	Oxl5E5
		05.008.25	0x5C87
		06.001.25	0x9564
		07.005.27	OxE17E
		07.006.27	0x3329

Application name	description	version	checksum(s)
VgaMgr.Arm	Interface to the VGA display	00.006.31	00005616
		00.00632	Ox2F17
		00.006.33	Ox4BB6
		00.006.38	OxBDC6
		00.006.41	0x6867
		00.006.42	0x4C25
		01.000.59	0xE851
		02.000.60	0x6084
		02.003.60	0x6084
		03.000.60	0x62E8
		04.000.67	OxEF76
		05.001.74	0x4515
		05.003.75	OxEE2D
		05.006.75	0x9890
		05.008.77	Ox62EB
		06.001.77	0xB899
		07.005.81	Ox3FF8
		07.006.81	0xE268
IFSF srv.Arm	TCP IFSF pump controller interface	00.000.02	OxOB06
		00.000.03	OxOC41
		00.000.03	0x0E39
		00.000.03	0x253B
		00.000.04	OxDB3D

6.5.2.2 Pre processor (PP) software (for WWC1.1 E10)

Application name	description	version	checksum
PP	Pre-processor module	00.001.31	0000454F
		00.006.42	OxBB57
		00.006.44	0x1 E45
		01.000.50	OxA9A4
		02.000.52	Ox5E8F
		03.000.54	OxA7C4
		05.000.58	OxBF07
		05.000.65	Ox8CC9
		06.000.68	OxE1FB
		06.000.70	Ox1 DC9
		07.000.73	0x85F4
		07.001.75	OxCC80
		07.003.76	OxEE38

6.5.2.3 Pre processor (PPC) software (for WWC1.1 E1O)

Application name	description	version	checksum
PPC	Pre-processor module	06.000.68	OxDD4F
		06.001.72	0x8C3F
		07.000.73	0x961 F
		07.003.76	OxA572

6.5.2.4 Pre Processor (PPE) Software

Application name	description	version	checksum
PPE	Pre-processor module	05.000.58	0x39B8
		06.000.68	OxDD4F
		06.001.72	OxEECD
		07.001.75	Ox6FB5
		07.003.76	0x86E5

6.5.2.4 Pre processor (PPCE) software

Application name	description	version	checksum
PPCE	Pre-processor module	06.000.68	OxE2A7
		06.001.72	Ox4C5E

6.5.2.5 ST software (only for the WWC1.1 EST)

Application name	description	version	checksum
	Single twin software	05.001.05	0x0327
		06.001.08	0xE 199
		07.001.16	Ox8E6E
		08.000.19	OxCC84
		08.000.20	OxCCA7

6.5.2.6 STE software (only for the WWC1.1 EST)

Application name	description	version	checksum
STE	Single twin software	05.001.05	OxFDC5
		06.000.06	OxEB9C
		06.001.08	0x34A5
		07.001.15	OxCDEO
		08.000.19	OxCDEO
		08.000.20	Ox1 FDF

6.5.2.7 Indicating devices software

Application name	description	version	checksum
CSD	CAN based LCD display	_ 00.001.03	00008671
		00.006.15	OxD83B
		02.000.27	Ox6FF3
		03.000.30	OxEF7A
		05.001.38	OxA1 FA
		05.000.39	0x97E3
		05.001.39	0x97E3
		06.00040	Ox1F6F
		07.001.42	Ox6B6B
CSDC	CAN based LCD display (Cortex based)	05.001.11	OxDEE3
		06.001.15	OxC2DB
		07.000.16	Ox7F74
		07.001.17	Ox550E
		07.002.18	OxFCO1
VGA	VGA screen (Ethernet connected)	00.008.00	0x3B551A95
		00.008.04	OxC74AAB23
		00.008.08	0x97CB865A
		00.008.12	0x2764D6EB
		00.001.04	0x70C7 E761
		01.000.00	0x8331 D612
		02.000.00	Ox480A82DD
		04.000.03	OxE1D2A9C7
		04.001.00	0x3475B699
		05.001.00	Ox1A3OF1FB
		05.002.00	OxEFA1O201
		05.003.00	Ox30CBA253
		05.005.00	0x870E5B36
		05.008.00	OxD30A4F70
		07.002.02	OxFC2DD913
		07.002.03	Ox6064E 1 CD

6.5.2.8 TQC-MPC3 and TQC-MPL3 impulse encoder software.

version	checksum
00.001.15	00006371
00.006.20	0x5115
00.007.23	0x2885
01.000.27	Ox38FD
02.000.28	0x86E4
05.000.32	OxED33
05.001.36	0x5C26
06.000.37	0x7363
06.001.42	OxF786
07.001.44	0x768C
07.001.17	0x4781
07.003.48	0x5326

6.5.2.9 TQC-MPCE impulse encoder software (applies to impulse encoders TQC-MPC3 and TQC-MPL3).

version	checksum
05.000.32	0x0930
05.000.37	Ox9D66
06.001.42	OxF362
07.001.44	, 0x87A7

6.5.2.10 TQC-MPCC impulse encoder software (applies to impulse encoder TQC-MPC5).

version	checksum
05.001.36	Ox653F
06.000.37	0x8006
06.001.42	Ox6D8F
07.001.44	OxDF32
07.003.48	OxAE94

6.5.2.11 TQC-MPCCE impulse encoder software (applies to impulse encoder TQC-MPC5).

version	checksum
06.000.37	0x9225
06.001.42	Ox1B1F
07.001.44	0x5851

6.5.2.12 TQC-LON interface.

version	checksum
00.001 A6	0000AEDB
00.001.10	OxA7D7
02.00014	OxF4F6
03.000.16	0x9291
04.000.18	Ox92C8
07.001.22	0x92C8

6.5.2.13 TQC-LONC interface.

version	checksum
05.000.14	OxACEA
05.000.15	OxBAD8
06.001.21	Ox108B
07.001.23	OxD669

6.5.2.14 EIN interface.

version	checksum
00.007.04	0x029D
02.000.07	Ox6E4A
02.000.13	0x9638
03.000.14	Ox28BA
05.000.17	0x9393
05.001.21	OxF69F
05.001.23	0x3C 15
06.000.24	0xD624
07.001.26	0x43C8
07.003.29	0xF503
08.000.30	0x999D
08.000.31	0x8332

6.5.2.15 UDC interface.

version	checksum
03.000.12	0x122D
03.000.15	0x35C7
04.000.19	Ox51 F5
05.000.23	OxF75A
05.000.25	Ox996B
05.000.26	0x9973
05.000.29	Ox51 C8
05.001.37	0x1 C50
05.001.38	0x211 C
06.001.43	0x9725
07.001.45	OxF709
07.002.50	OFEE9
08.000.54	0x42F9

6.5.2.16 UDCC interface.

version	checksum
06.000.41	Ox5FCF
07.001.45	0xC267

6.5.2.17 Logitron interface.

version	checksum
03.000.03	OxB7F7
05.000.11	0x4A98
05.001.14	Ox5E7A
06.001.16	0x1 D18
07.001.17	0x4781

6.5.2.18 EPS / Dresser interface.

version	checksum
05.000.06	Ox3ED7
05.000.12	OxB6B7
05.000.14	0x3908
05.001.16	OxD7A5
06.001.20	OxlOD8
07.001.21	Ox11AF
07.001.22	Ox45BA

6.5.2.19 ZSR / Dunclare interface.

version	checksum
05.000.06	Ox15F7
05.001.09	OxC28D
06.000.10	Ox3DDB
07.001.11	Ox2A15
08.000.19	OxC1 EC
08.000.21	OxBB47
08.000.22	OxADBB

6.5.2.20 GIL interface.

Version	Checksum
07.000.00	OxB2DE

7 STAGE II VAPOUR RECOVERY

7.1 ECVR or ASF Assisted Vapour Recovery System

As described in the certificate but having either an ECVR or ASF assisted vapour recovery system. These systems extract 10% greater vapour by volume than fuel delivered. Independent electronics control the rate of vapour extraction by the Burkert electronic control valve. These electronics and valve are common to each system. A schematic of each system is shown in Figure 40a.

Vapour recovery may be supplied for each grade of fuel. The existing hose is replaced by a co-axial hose with the vapour line converted to small bore copper pipe at the connection to fixed pipe. The nozzle is replaced by a vapour recovery nozzle which incorporates a vapour annulus. Recovered vapour is returned to the supply tank independent of the dispenser hydraulics.

The CoCa electronics may be fitted with LCD displays. This system may also be fitted to WWC and WWC-T1 Calculator Heads.

The electronic control valve described in the first paragraph may be any suitable alternative, an alternative layout using a Durr vacuum pump is shown in figure 40b.

7.2 Nuovo Pignone vapour recovery system RV-01 - open frame version and explosion proof version

7.2.1 Description

As described in the certificate but having an assisted vapour recovery system. When the vapour control electronics detect pulses from one of the pulsers the vapour pump is turned on and the relevant voltage is supplied to the vapour control valve, controlling the rate of vapour extraction. These electronics and valves are common to each system. A schematic of each system is shown in Figures 44, 45 and 46.

Vapour recovery may be supplied for each grade of fuel. The existing hose is replaced by a co-axial hose with the vapour line converted to small steel or plastic pipe at the connection to fixed pipe. The nozzle is replaced by a vapour recovery nozzle that incorporates an annulus vapour duct. Recovered vapour is returned to the supply tank independent of the dispenser hydraulics via a non-return valve.

The gas outlet of the air separation unit must not be connected to the vapour recovery system.

The vapour recovery module used may be one of two types, an open frame version (Figure 41) for installation in non-explosive areas, or an explosion proof version (Figure 42) for use in explosive areas. Both versions may be connected to the pulse output from the pulser via a junction box or to a pulser output from a magnetic encoder (Figure 3) mounted on the meter shaft.

This approval does not permit the connection of the vapour recovery module directly to the calculator.

NOTE: For each dispenser types the hazardous and non hazardous areas are defined by the safety certification documents. This documentation specifies where each component of the vapour recovery system may be installed.

7.2.2 Components

The vapour recovery system comprises of the following main components:

Manufacturer	Description	Model No:
Nuovo Pignone	vapour recovery control module Open frame version Explosion proof version	 TSO91033-34 TSO91030-31
Nuovo Pignone	Power supply board	TSO31086
Nuovo Pignone	magnetic encoder	SWITCH MZ94
Nuovo Pignone	vacuum pump motor (filter on suction side as an option)	NFB459001061 (or similar model)

7.3 Malte Persson Meg-95 assisted vapour recovery system

As described in the certificate but having assisted vapour recovery system, with or without system monitoring, schematics of both systems are shown in figures 47 and 48. When the vapour control electronics detect pulses from one of the pulsers the vapour pump is turned on and the relevant voltage is supplied to the vapour control valve, controlling the rate of vapour protection.

The monitoring system is a Gilbarco VMC with a GE1 meter, it checks for the correct operation of the system, and if after a number of consecutive transactions the system is found to be functioning incorrectly an alarm system is activated. This indicates to the operator or owner of the dispenser, that the monitor has detected a fault condition with the vapour recovery system and the system should be serviced or repaired. The alarm can either be local at the dispenser (indicating lamp) or can be remotely located in the kiosk area. If, after a certain period, the dispenser has not been repaired, the appropriate fuelling position will be automatically disabled until the repair is carried out.

Vapour recovery may be supplied for more than one nozzle. The existing hose is replaced by a co-axial hose with the vapour line converted to small bore copper or stainless steel pipe at the connection to fixed pipe. Recovered vapour is returned to the supply tank independent of the dispenser hydraulics. The gas outlet of the air separation unit must not be connected to the vapour recovery system.

7.4 Fafnir Vaporix Stage II Vapour Recovery System

As described in the certificate but having assisted vapour recovery system, with or without system monitoring, a schematics of the monitored system is shown in figure 49. As dispensing commences the amount of vapour displaced from the vehicle's tank is sucked through the vapour recovery pipe work at a rate that matches the flow rate of fuel being dispensed into the vehicle's tank. This is achieved by connecting to a single channel of each pulser, using a high impedance CMOS buffer circuitry to minimise the load on the pulser circuit. This circuitry then provides buffered outputs for both the flow rate control circuits and the automatic monitoring system. The Burkett flow control unit takes the buffered flow rate and controls a proportional valve that restricts the flow of the vapour recovered and also energises the vacuum pump operation. The monitoring of recovered vapour provides enhancement to the standard vapour recovery package detailed above. The resulting system is referred to as "Enhanced Vapour Recovery" or "EVR".

The Vaporix monitoring unit checks the fuel flow rate from the buffered flow rate unit against its vapour flow sensor readings. The system is deemed functioning if the volumetric vapour reading lies between 85% and 115% of the fuel flow rate. If for 10 consecutive transactions the reading is outside this range then the monitor will alert the operator at the kiosk or locally at the dispenser.

After seven days, if the unit has not been serviced by an authorised engineer the Vaporix monitor unit will disable the dispenser by disconnecting the appropriate pulser power supply connection. The calculator will immediately detect a pulser error status and prevent any further dispensing. The communications to the kiosk is achieved by implementation of an IFSF LON protocol interface unit.

Figure 50 is a block diagram that shows the electrical interconnections between the elements of the system. Figure 51 details the construction and appearance of the electronic installation which is mounted securely within the dispenser head enclosure.

Vapour recovery may be supplied for more than one nozzle. The systems described consist of the following standard components:

Vapour meter	Fafnir Vaporix-flow
Electronic control unit for vapour monitoring systems	Fafnir Vaporix-control
Pulse control module	Fafnir Vaporix PCM
Kiosk alarm indicator	Fafnir Vaporix-master (optional)
Condenser	Fafnir Condensate separator
Electronic control unit for vapour recovery systems	Burkert 1094
Fuel / vapour splitter adaptor	Elaflex ZAF series
Safety break	Elaflex CBS21
Vapour pumps	ASF 8014 series Durr MEX 0831 series Or any approved vapour vacuum pump
Proportional valve	Burkert 2832 series Burkert 6022 series

Recovered vapour is returned to the supply tank independent of the dispenser hydraulics. The gas outlet of the air separation unit must not be connected to the vapour recovery system.

8 VOLUME CONVERSION DEVICES

8.1 MPE pulser incorporating a volume conversion device (temperature compensation) and/or electronic calibration

8.1.1 Introduction

The fuel dispenser is modified to enable the volume to be temperature corrected for volume to 15°C and/or to have electronic calibration. The components in this system are shown in figure 52.

8.1.1.1 Volume conversion device (temperature compensation) and electronic calibration

The temperature compensation function and electronic calibration is added by the connection of an alternative pulser designated the MPE which enables the pulse output stream to be adjusted.

8.1.1.2 Electronic Calibration

Electronic calibration is effected by adjusting the number of pulses per rotation of the meter output shaft.

8.1.1.3 Temperature compensation

The volume of fuel passing through the meter is corrected to 15°C by monitoring the temperature of the fluid passing through the meter and adjusting the number of pulses per rotation of the meter output shaft.

The pulse output is no longer a fixed number of pulses per rotation of the meter output shaft, but adjusts the volume of fuel as if it is dispensed at 15°C.

8.1.2 CONSTRUCTION - MPE pulser

The MPE has a pulser circuit that includes a real time clock, which enables an event logger to record all changes to pulser programming, whether these be modifications to the temperature compensation parameters (fuel type etc) or electronic calibration activities.

For temperature compensation operation the MPE pulser incorporates a second cable entry to provide a connection port for a temperature probe which is fitted through the meter cover plate, such that the probe tip is immersed in the fuel being dispensed. The probe tip does not come into contact with any meter components. The probe cable is routed to the electronic circuit board within its associated pulser housing.

The probe is a Class A, PT100 type device. There is no regular calibration required of the probe and the pulser checks the temperature probe for errors.

8.1.2.1 Installation

The pulser cable carries an additional 2 cores, which are a communication link to the intelligent pulser circuit board. The other 4 cores are the traditional power and pulse output signals. The cable routes up to the dispenser calculator enclosure and routes to a hand set connection circuit board within a steel pulser sealing box (PSB). Connectors are provided to link the pulser communication port to a standard Tokheim plug-in programming handset.

8.1.2.2 Indication of measurement result

A legend shall be affixed adjacent to the volume indication clearly indicating that the volume dispensed is corrected to 15°C.

8.1.3 Adjustments

A programming handset is required to make adjustments to the calibration and temperature compensation. The programming handset also provides the function of displaying the volume, temperature compensated volume, and the recorded temperature for the measurement. The handset can only be connected by removing the seals to the connector covers (figure 53).

The procedure for making adjustments to the meter calibration is to disable the temperature compensation function before performing either a mechanical or electronic calibration. The handset is then used to enable/disable and program temperature compensation functions (such as fuel density type), and provide an electronic calibration sequence.

8.1.3.1 Electronic calibration

To calibrate electronically, the handset is used to record the volume dispensed into a measuring vessel (unadjusted for temperature) and the associated amount displayed on the calculator indicator.

8.1.3.2 Temperature compensation

Programming the temperature compensation functions, including setting fuel type/density, are described in the Technical Manual Ref: 941005-001 Revision 1.X, where "X" may be any number representing a minor revision.

8.1.4 Sealing

8.1.4.1 The connectors for the handset are either behind a single steel lid sealed with a wire and seal, or behind individual small steel plates that may seal an individual pulser communication connection (figure 53).

8.1.4.2 The meter is sealed as shown in figures 54 and 55. This ensures that the temperature probe is secured by the sealing wire. Alternatively the probe may be fitted through an elbow connection at the meter outlet, in which case a sealing wire is routed through the probe head and around the pipe connection.

8.1.5 Conditions

8.1.5.1 For dispensers providing temperature compensation, the primary indicator (dispenser display) shall clearly indicate that the volume dispensed is corrected to 15°C.

8.1.6 Recommended tests

8.1.6.1 Check that the correct software version is installed on the programming handset before any adjustments are made. Software versions: 01.07, 01.08 and 01.09.

8.2 TVC volume conversion device (Temperature compensation device)

8.2.1 System Description

The TVC is a conversion device for use with two meters, intended for correcting volumes of fuel as if dispensed at 15°C. The temperature compensation function is added by connecting the TVC unit between the pulse output of the dispenser pulser and dispenser calculator. The TVC provides a pulse output stream corrected for temperature by monitoring the temperature of the fluid passing through the meter. The pulse output is no longer a fixed number of pulses per rotation of the meter output shaft, but adjusts the volume of fuel as if it is dispensed at 15°C. The TVC unit is shown in figure 56.

The conversion calculation for a certain density of fuel is determined by the selection of a suitable density block (module) as shown in figure 58. The density block contains the calculations as specified in the ASTM manual D1250-80, table 4. The density blocks are identified as follows:

Module identification	Density range in kg/m^3
B1	720 - 730
B2	730 - 740
B3	740 - 750
B4	750 - 760
B5	760 - 770
B6	770 - 780
D1	810 - 820
D2	820 - 830
D3	830 - 840
D4	850 - 860

8.2.2 Construction

8.2.2.1 TVC unit

The TVC circuit board is housed in a secure box which prevents unauthorised access to the calibration button and the power supply, data link, temperature sensor, density block and pulser connections. The box has a clear lid to allow inspection of the density block.
Optionally an LCD display (figure 57) may be installed which allows access to the following data by pressing the scroll button:
- Fixed Density
- Temperature (Actual temperature from liquid)
- Uncompensated volume 1(last delivery, 2 digits behind the comma)
- Uncompensated volume 2(last delivery, 2 digits behind the comma)
- When test button is pressed, display shows “bypass”
- Display shows “ERROR” when the TVC is defective or errors occur

8.2.2.2 Temperature sensor

A temperature sensor manufactured by E. Meurs BV and designated LM335 is connected to the TVC unit. The temperature sensor (figure 59) is installed in the fuel delivery pipe within one metre from the flow meter; a typical installation is shown in figure 60.

8.2.2.3 Software

An infrared port in the TVC unit allows the reading of data and performing the calibration via an infra red reader connected to a portable PC running the Windows based software 'Fuel Monitor', produced by E. Meurs BV. A typical data display is shown in figure 63

The software version number is: V1.01 and can be accessed with the 'Fuel Monitor' software, or by viewing the LCD screen in the TVC unit where fitted.

8.2.2.4 Indication of measurement result

A legend shall be affixed adjacent to the volume indication clearly indicating that the volume dispensed is corrected to 15 °C.

8.2.3 Adjustments

Adjustments to the calibration and temperature compensation of the TVC unit may be made using a PC having an infra red link and running 'Fuel Monitor' software or using the scroll buttons if the TVC unit has an LCD display.

8.2.4 Sealing

8.2.4.1 The TVC unit is sealed as shown in figure 61.

8.2.4.2 The temperature sensor is secured to prevent removal from the T-connector and the T-connector from the fuel pipe by routing a sealing wire through the sensor and around the pipe connection (figure 62).

8.2.6 Recommended tests

Check that the correct software version is installed in the TVC unit

9 CONNECTION TO MID APPROVED FUEL DISPENSERS AND SELF-SERVICE DEVICE SYSTEMS

9.1 Fuel Dispensers

In addition to the dispensers already included in this approval, the system may also include dispenser models which have been conformity assessed, and issued with a Type Examination certificate, by a Notified Body responsible for Type Examination (Annex B) under Directive 2004/22/EC.

The dispensers may be as described in the following MID EC type-examination certificates:

T10001 - Fuel Dispensers
T10096 - LPG
T10105 - AdBlue

9.2 Self-Service Devices

The dispensers in this approval may be connected to any compatible MID POS having an EC Parts Certificate issued by a Notified Body responsible for Type Examination (Annex B) under Directive 2004/22/EC.

The dispensers may be connected to the Fuel-POS system having EC evaluation certificate TC7346.

10 AUTHORISED ALTERNATIVES

Having the dispensers described in this approval connected to any compatible POS described in certificate number 2286/xx, where "xx" represents the number of the associated certificate e.g. "Variant" or "Supplement".

11 RECOMMENDED TESTS

The following tests may be performed in addition to those specified in Regulations in order to determine conformity with the approved pattern.

11.1 Check that unit price changes are inhibited when a sale is in progress.

11.2 Check that the sequence of all `8's, blanks and all `0's appear on the dispenser display prior to the start of a sale.

11.3 Check that it is not possible to authorise more than one nozzle on one side at any time.

11.4 Check that when returning from calibration mode, the volume display to revert to two decimal places

11.5 Check that the correct checksum number is generated and can be displayed on the volume display.

12 CERTIFICATE HISTORY

ISSUE NO.	DATE	DESCRIPTION
2286/80	26 June 2013	Certificate first Issued
2286/80 revision 1	2 October 2014	Revision 1 issued Addition of new section **10 AUTHORISED ALTERNATIVES,** subsequent sections are renumbered accordingly.
2286/80 revision 2	20 January 2016	Revision 2 issued Section 2.2.5 Nozzle Eng manufacture electronic nozzle added.
2286/80 revision 3	17 August 2016	Section 2.2.5: DOT ONE 300 and DOT ONE 500 added.

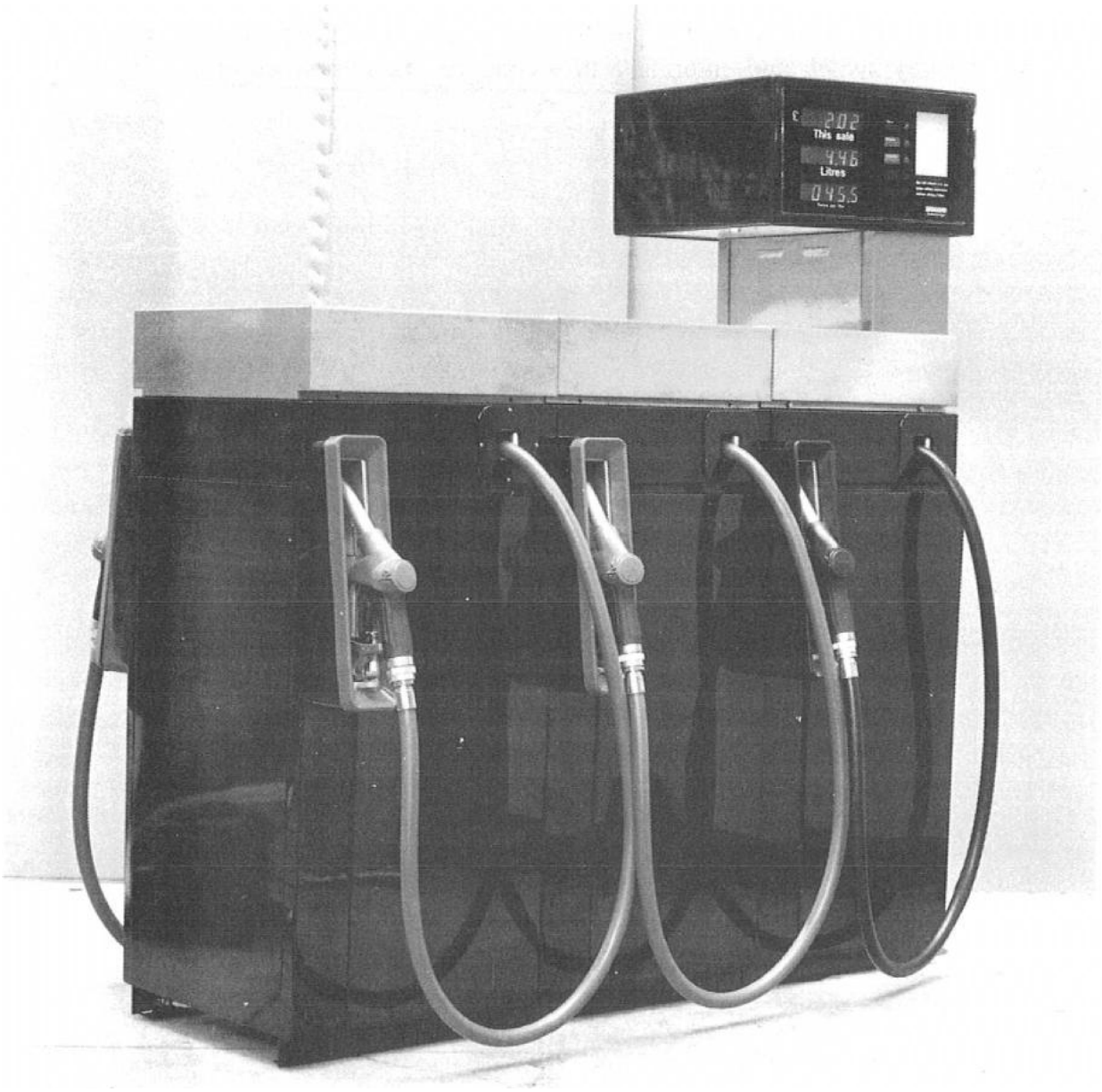


Figure 1 Elite dispense

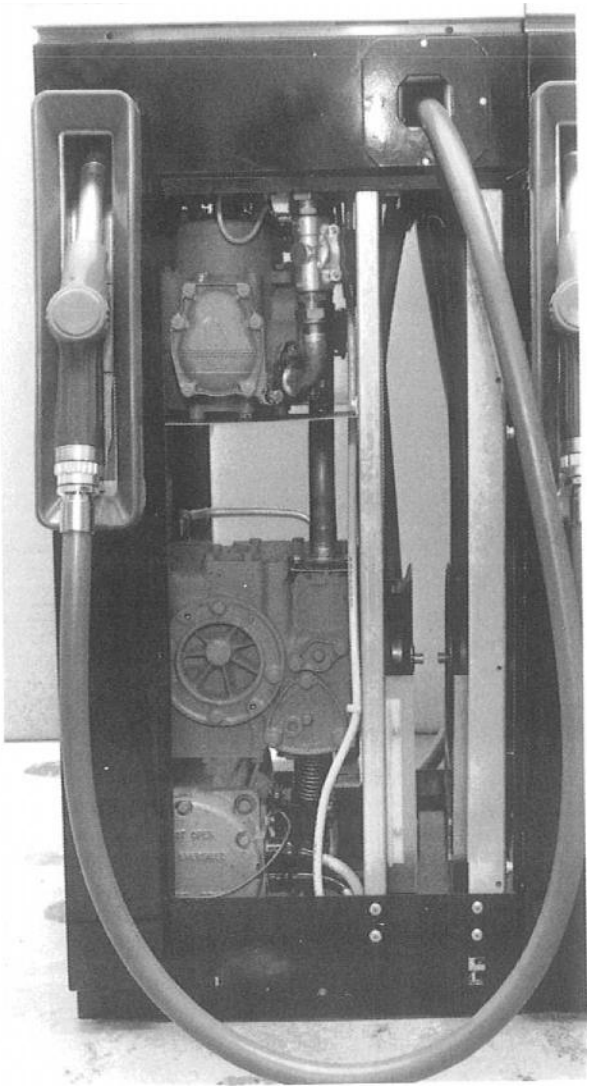


Figure 2 Tatsuno hydraulics

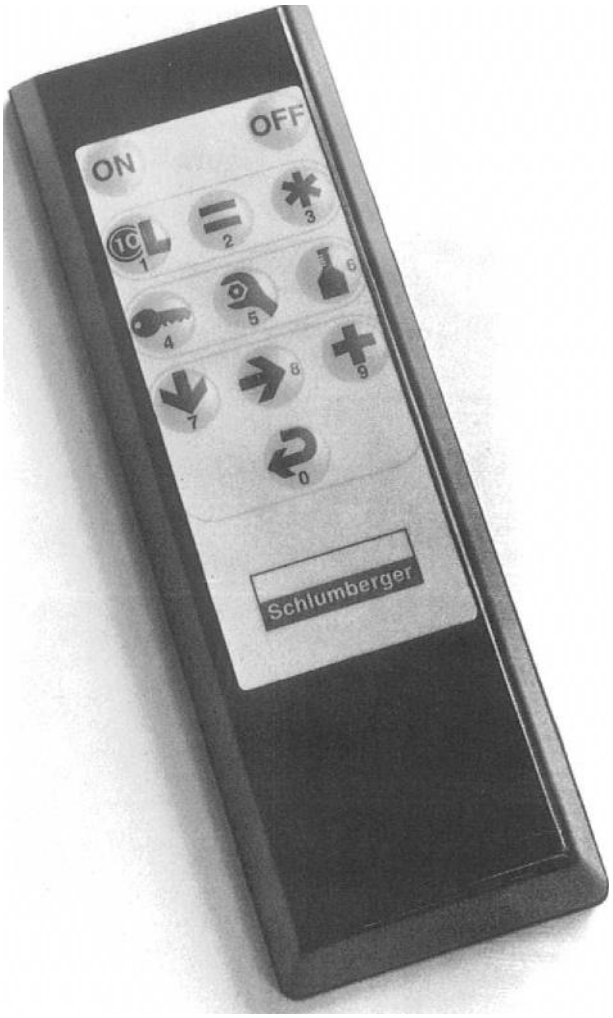
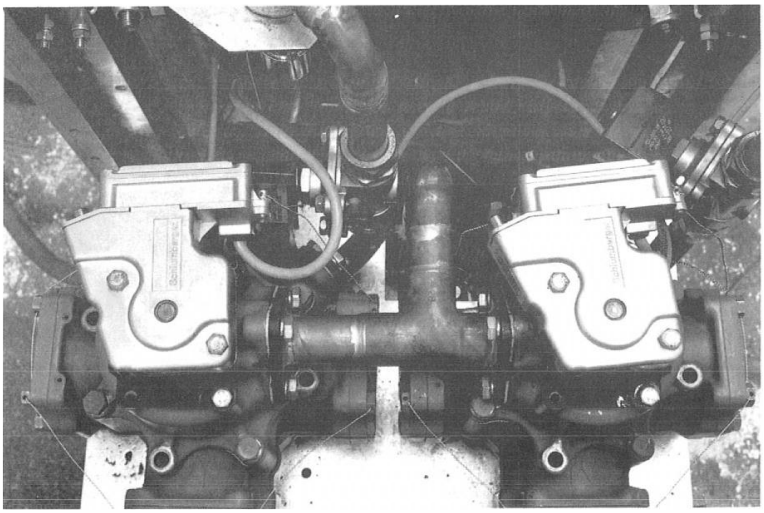


Figure 3 Infra-red remote control

Figure 4 Display head legends



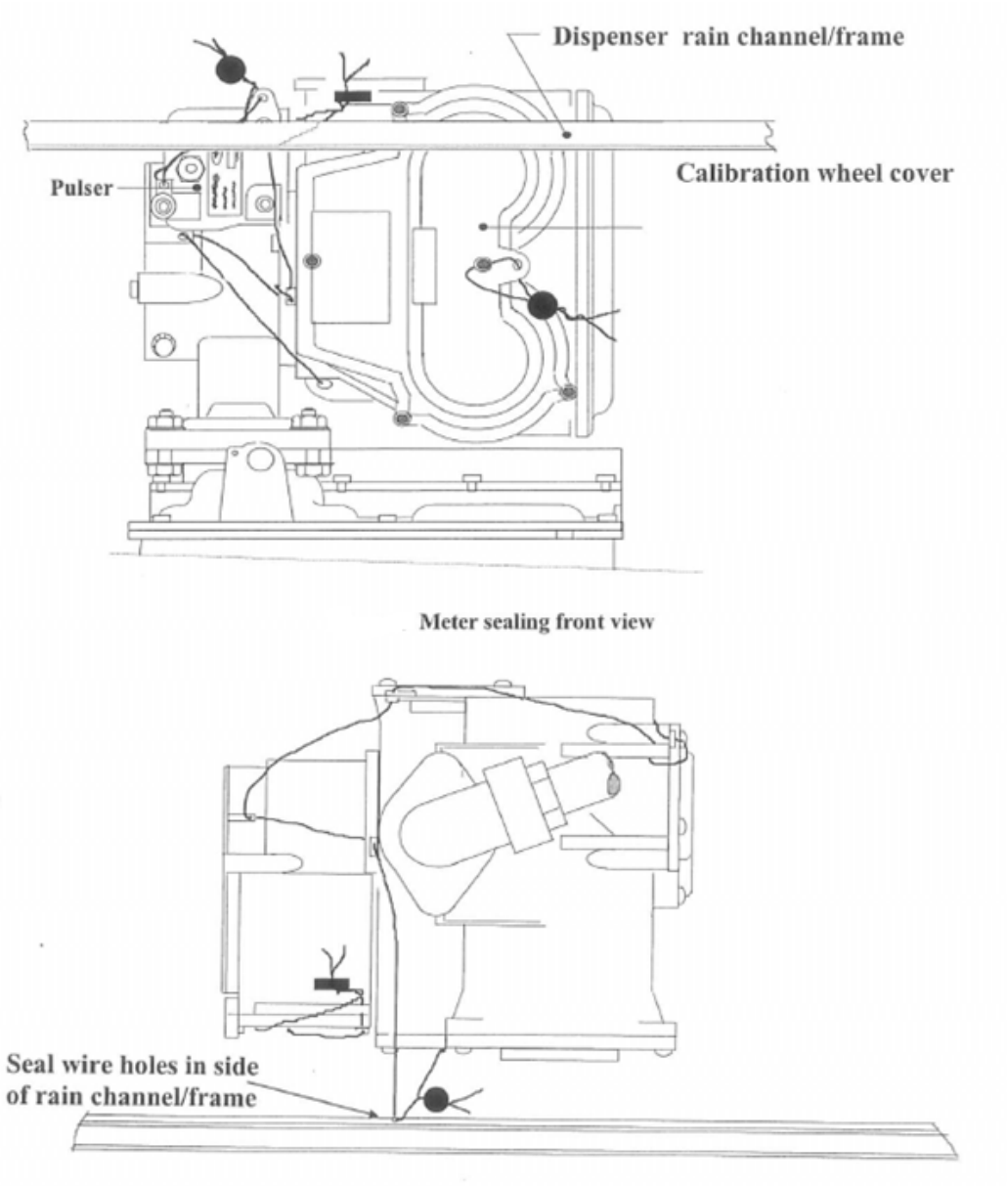


Figure 5 Sealing

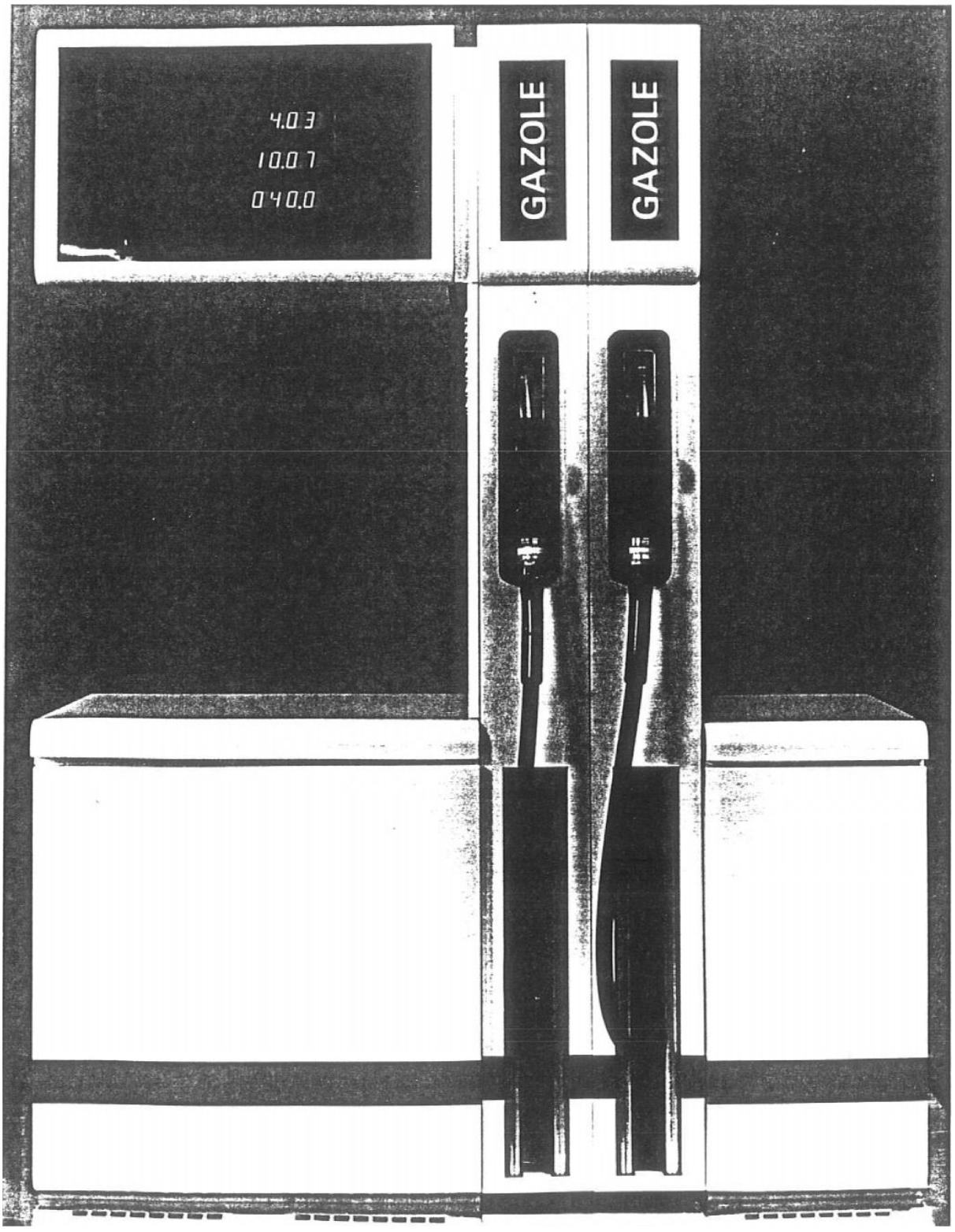


Figure 6 Range 2000

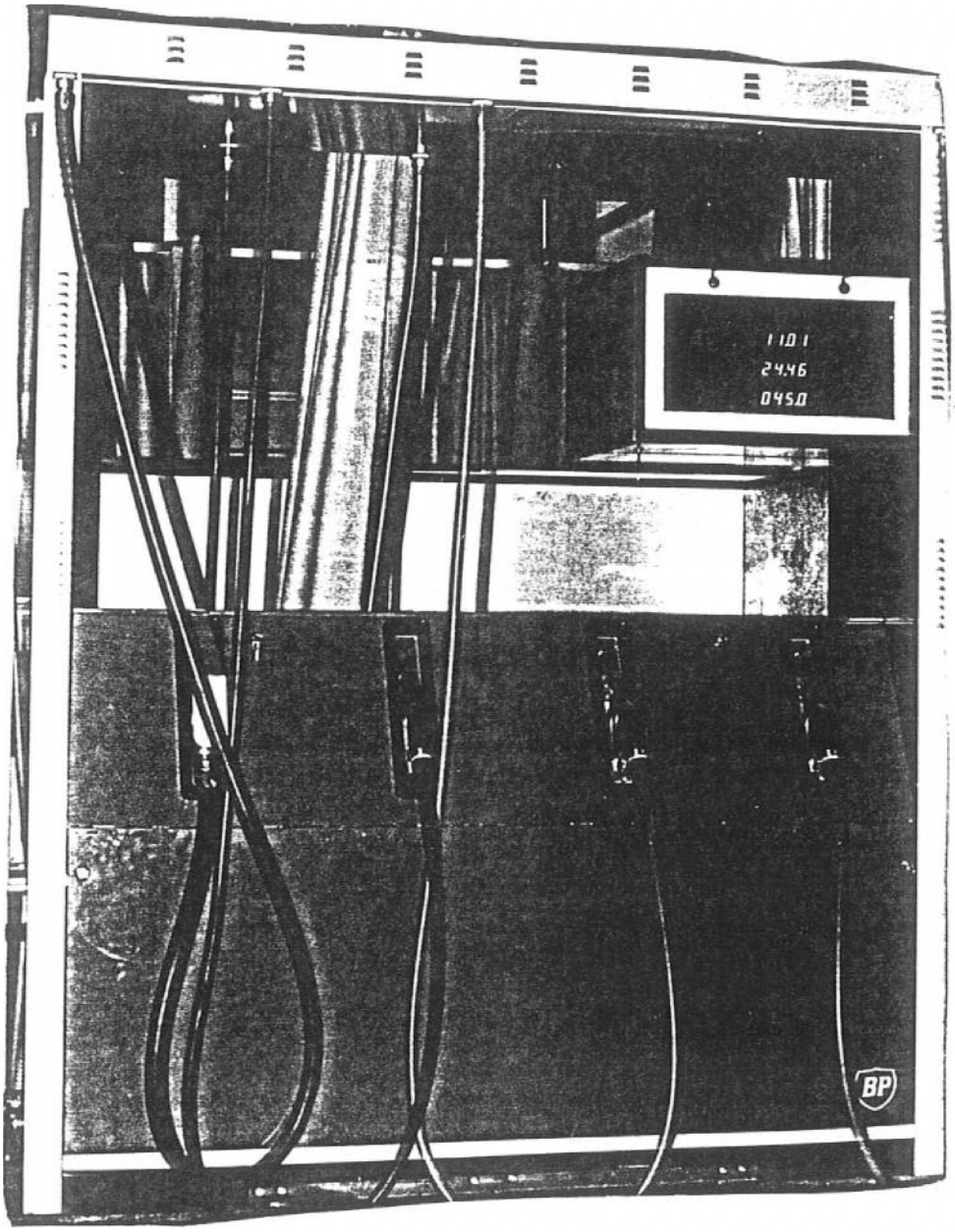


Figure 7 Level 5

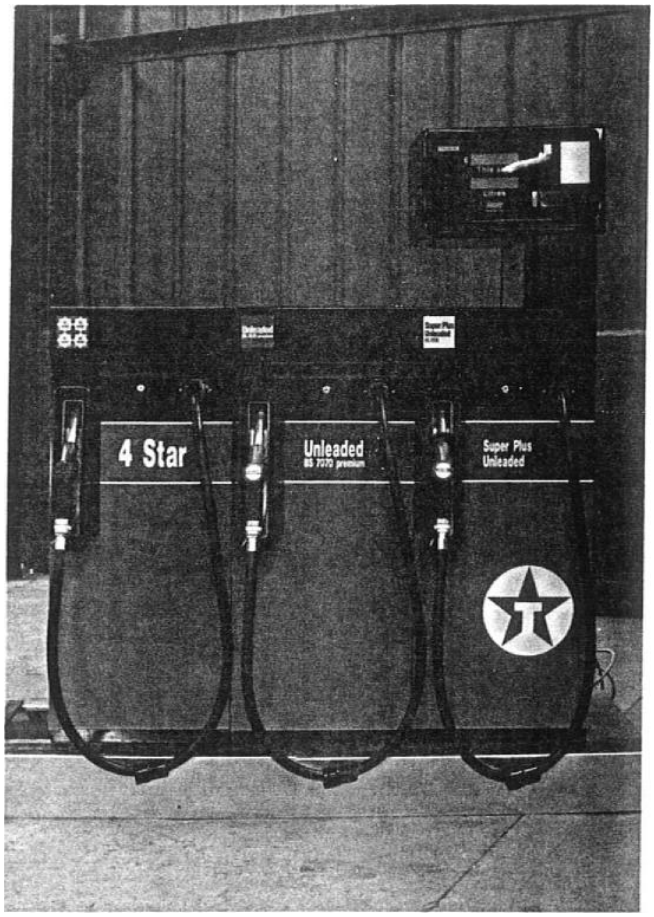


Figure 8 Industrial Cladding

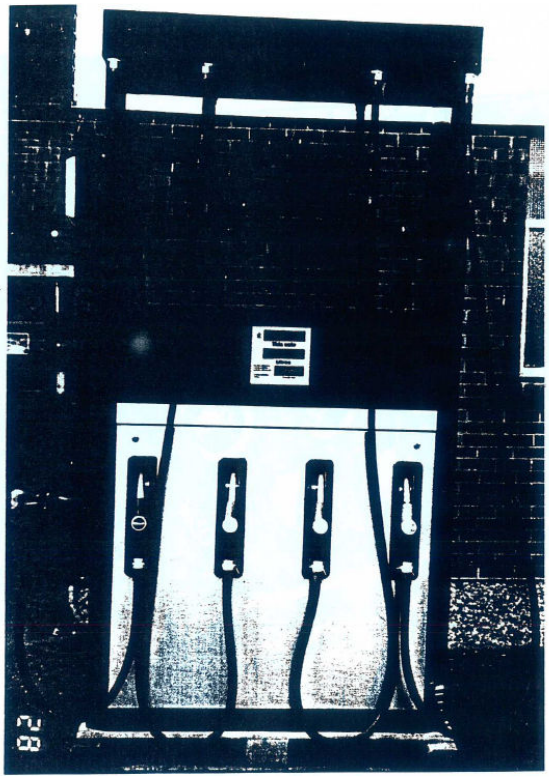


Figure 9 Pagasus

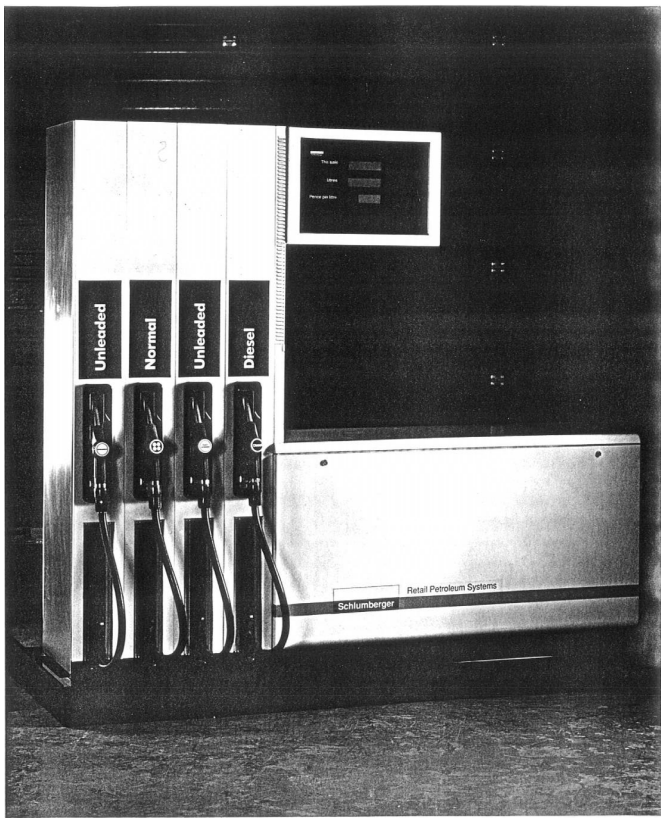


Figure 10 Optima

Figure 11 Quantium 100

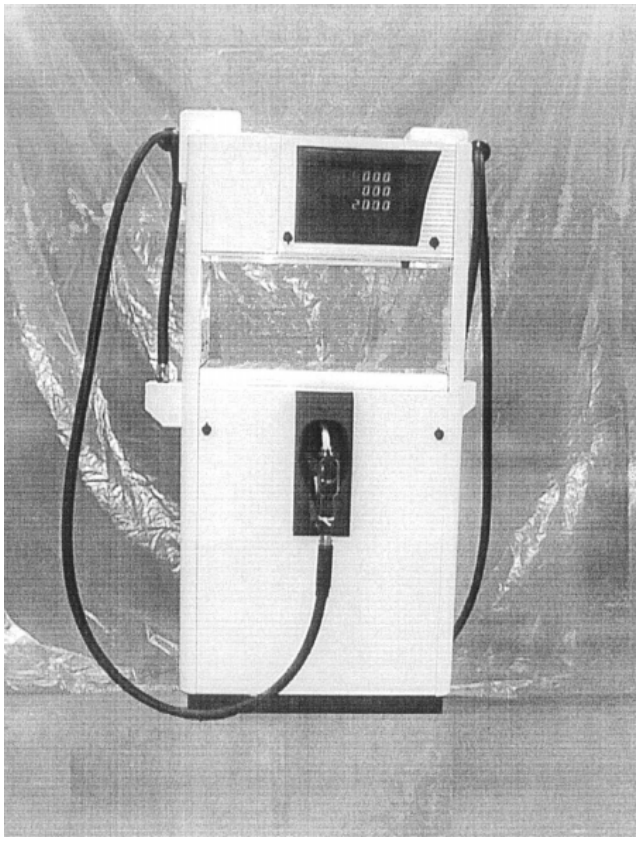


Figure 12 Quantium 200

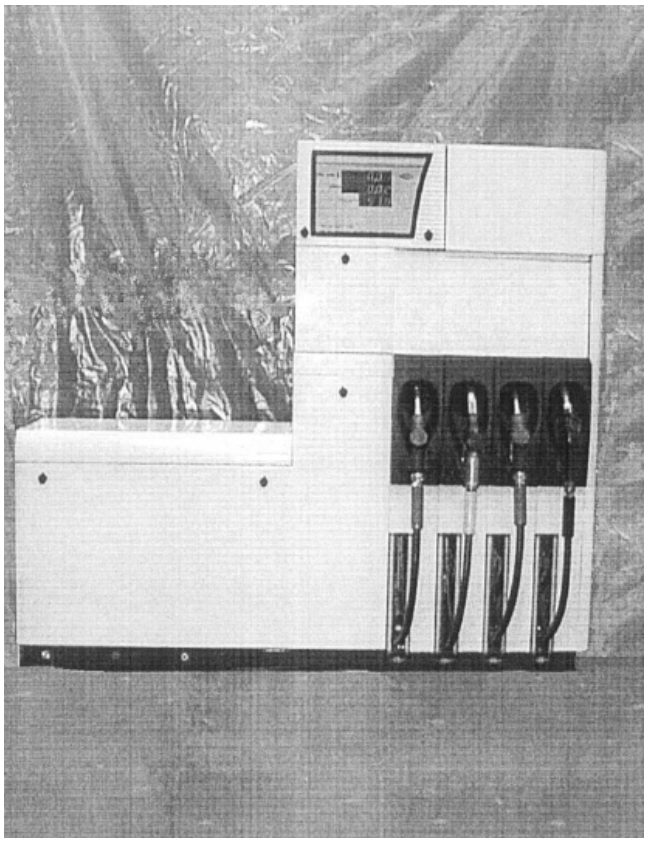


Figure 13 Quantium 500

Figure 14 Quantium 300 T housing

Figure 15 Quantium 400 T housing

Figure 16 Quantium 500 T housing

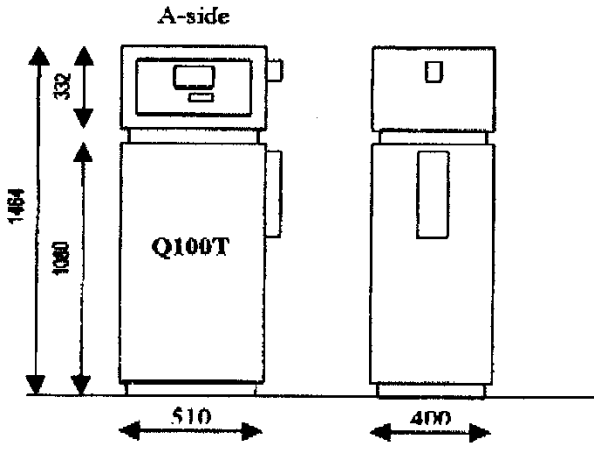


Figure 17 Quantium 100T model

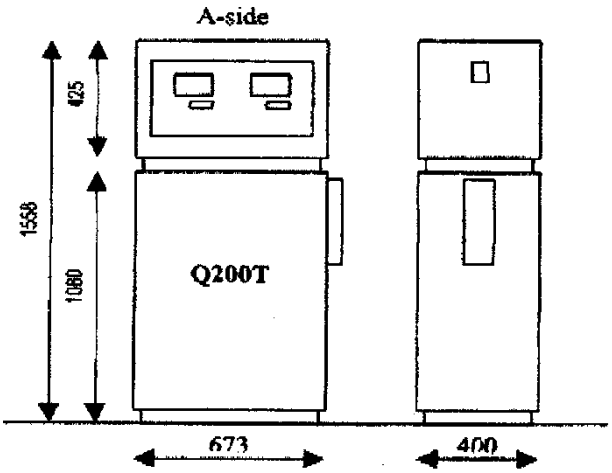


Figure 18 Quantium 200T model

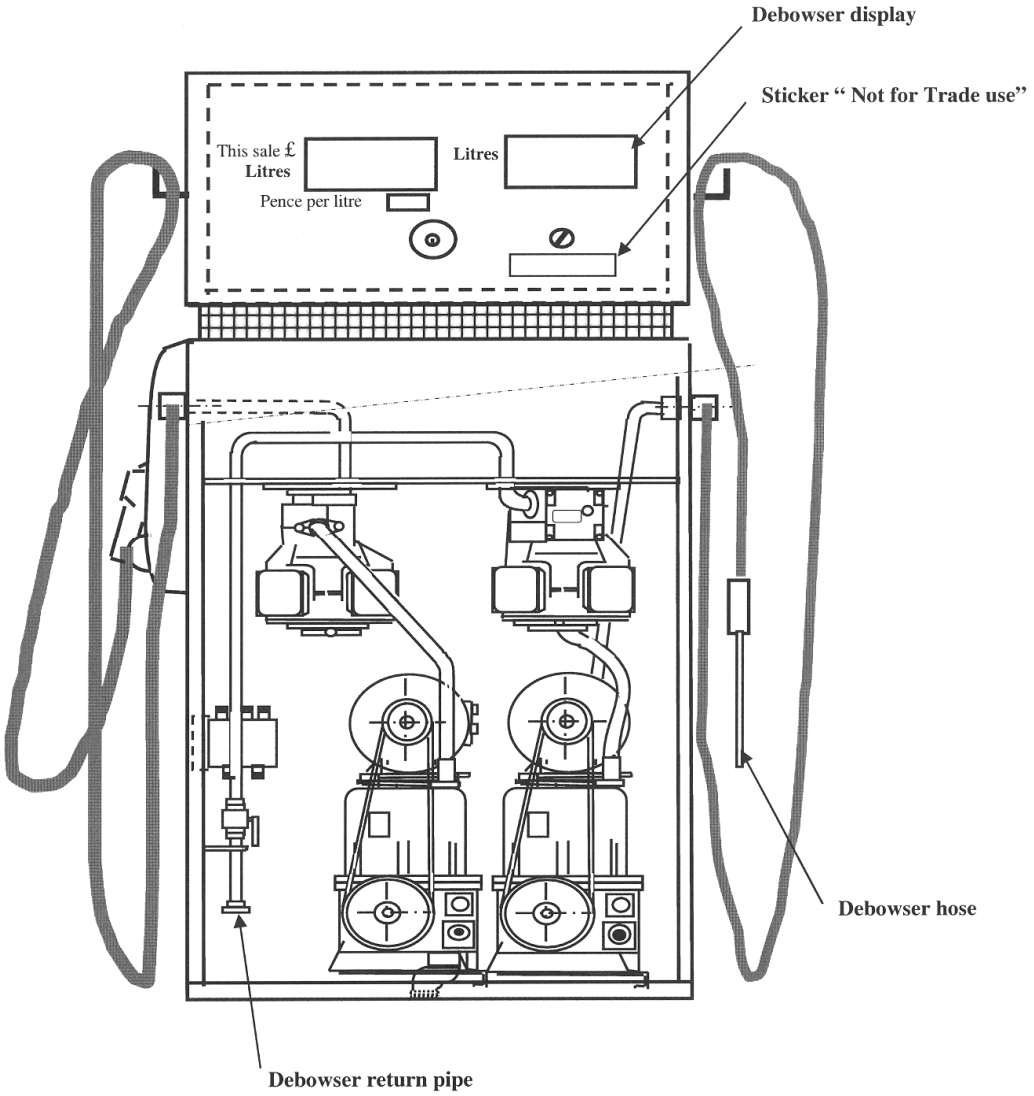


Figure 19 Quantium 200T metering dispenser and de-bowser

igure 20 Quantium 410 Dispenser

Figure 21 Quantium 510 dispenser with alternative electronics enclosure

Figure 22 Q510 n model with an optional third payment terminal fitted

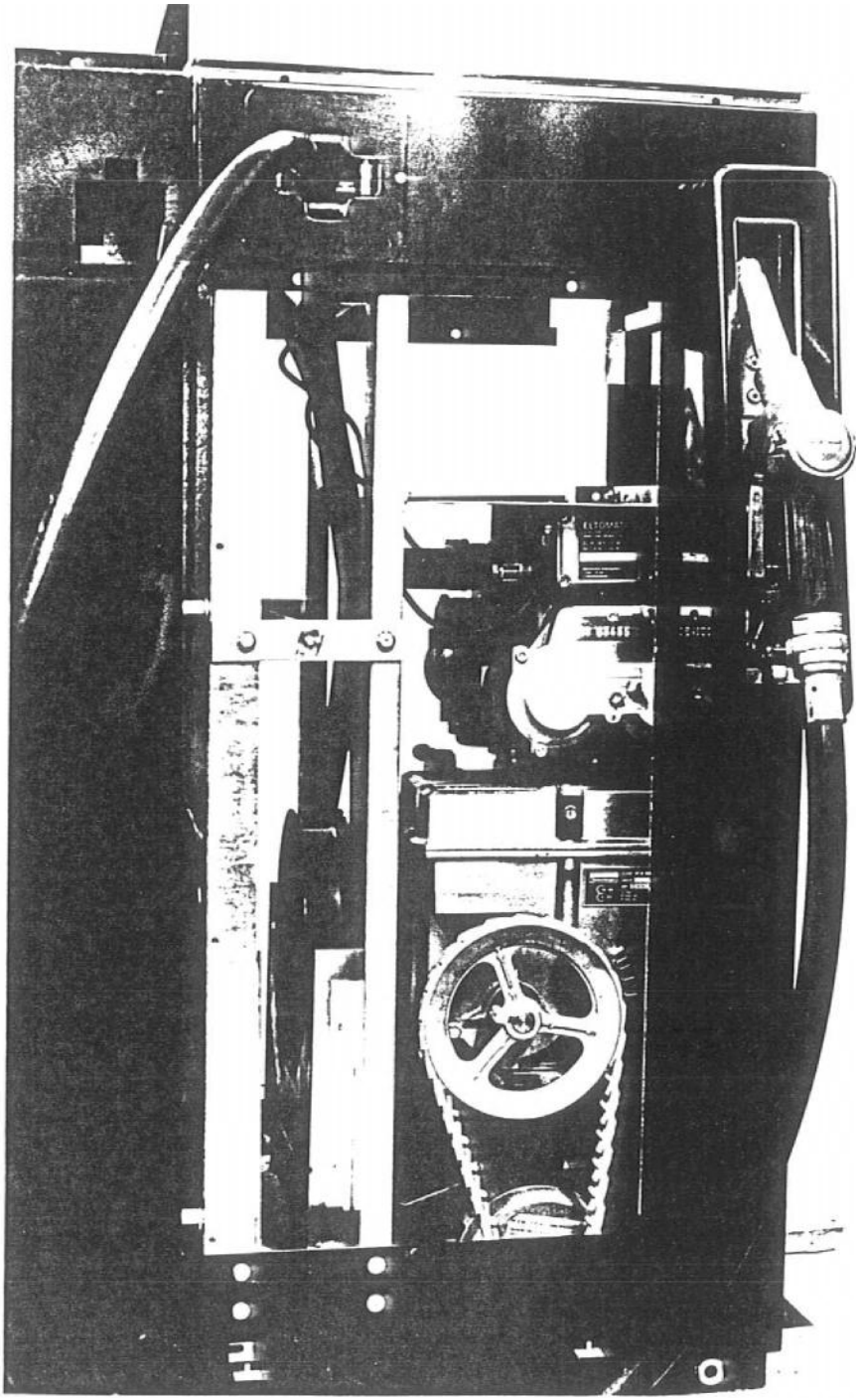


Figure 23 Schluniberger hydraulic unit

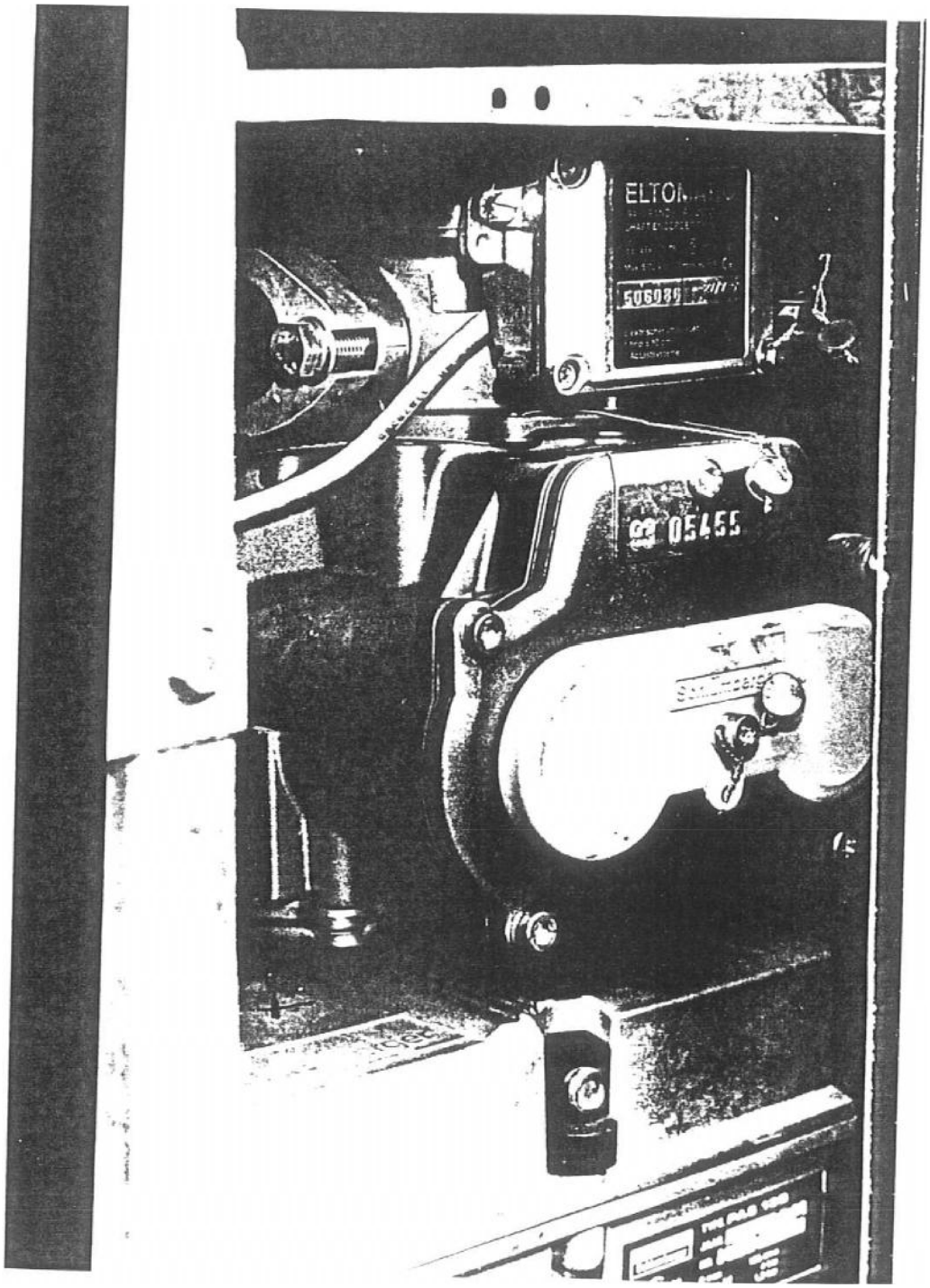


Figure 24 Meter and pulser sealing

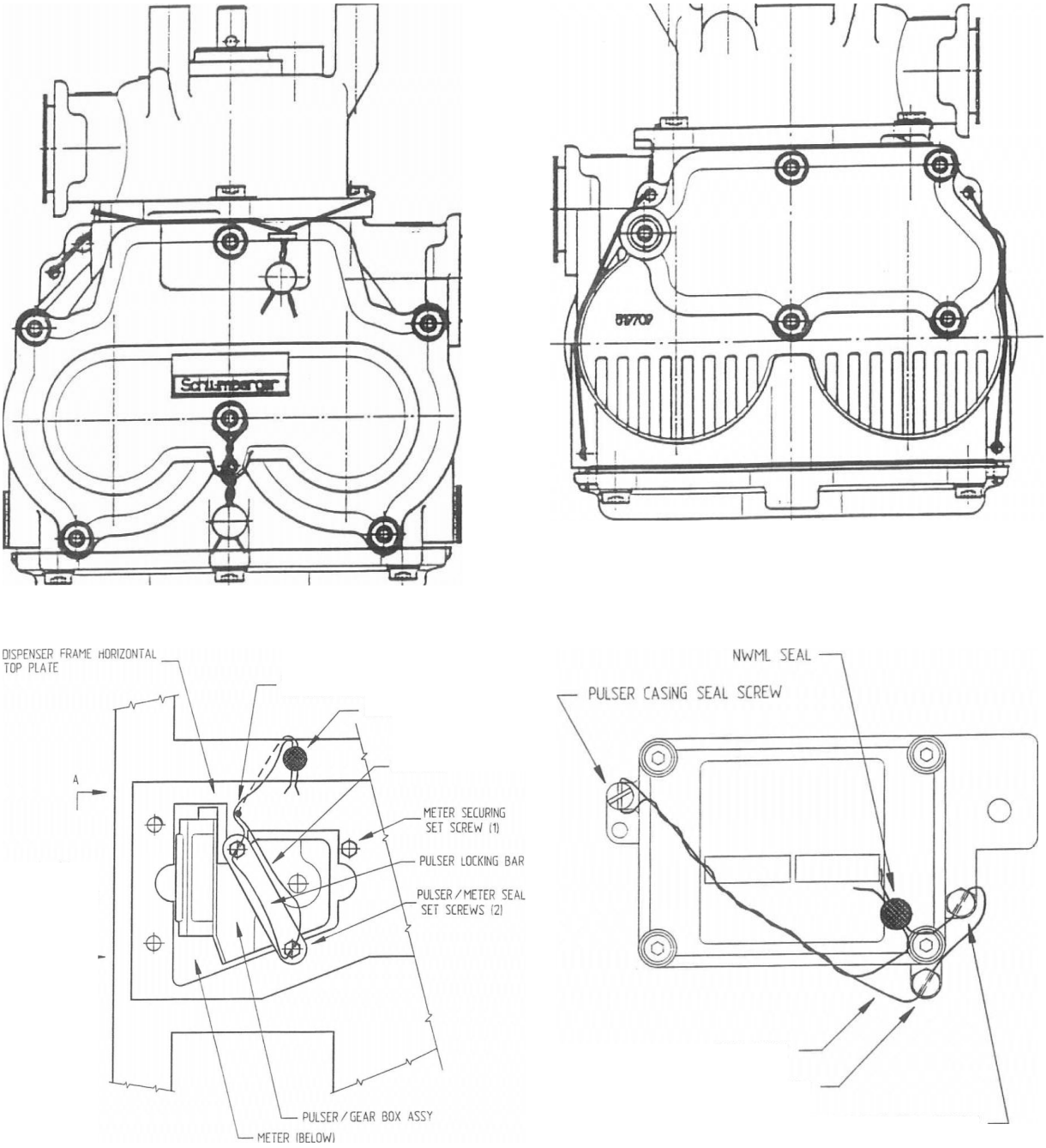


Figure 25 Schlumberger hydraulics Alternative Sealing

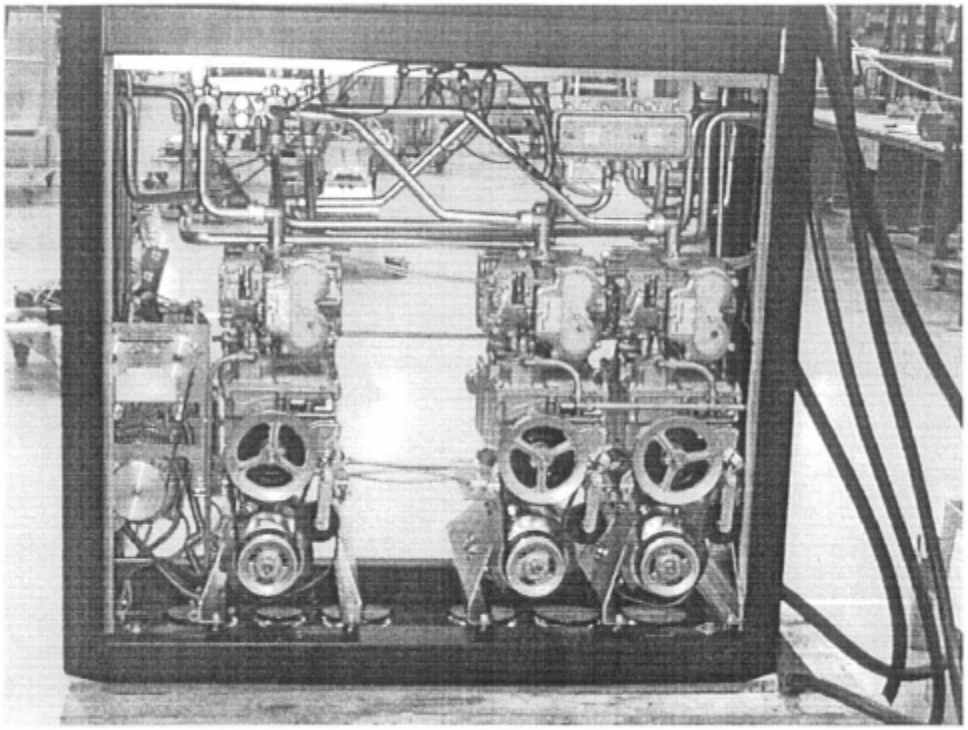


Figure 26 Alternative Tokheim hydraulic unit PAS V3

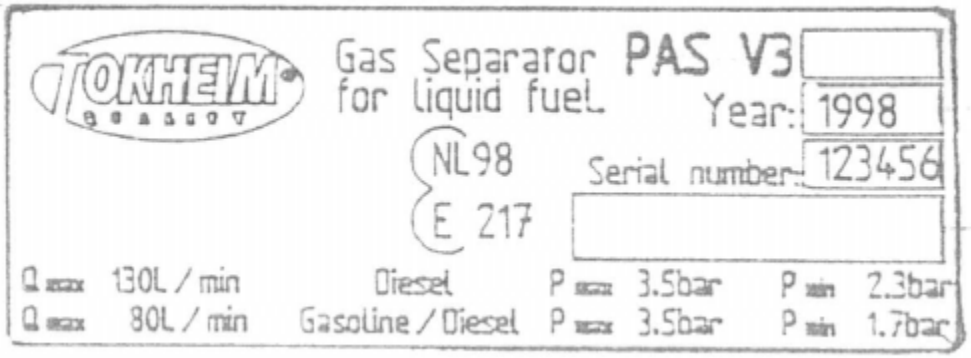


Figure 27 Alternative Tokheim hydraulic unit PAS V3 Data Label

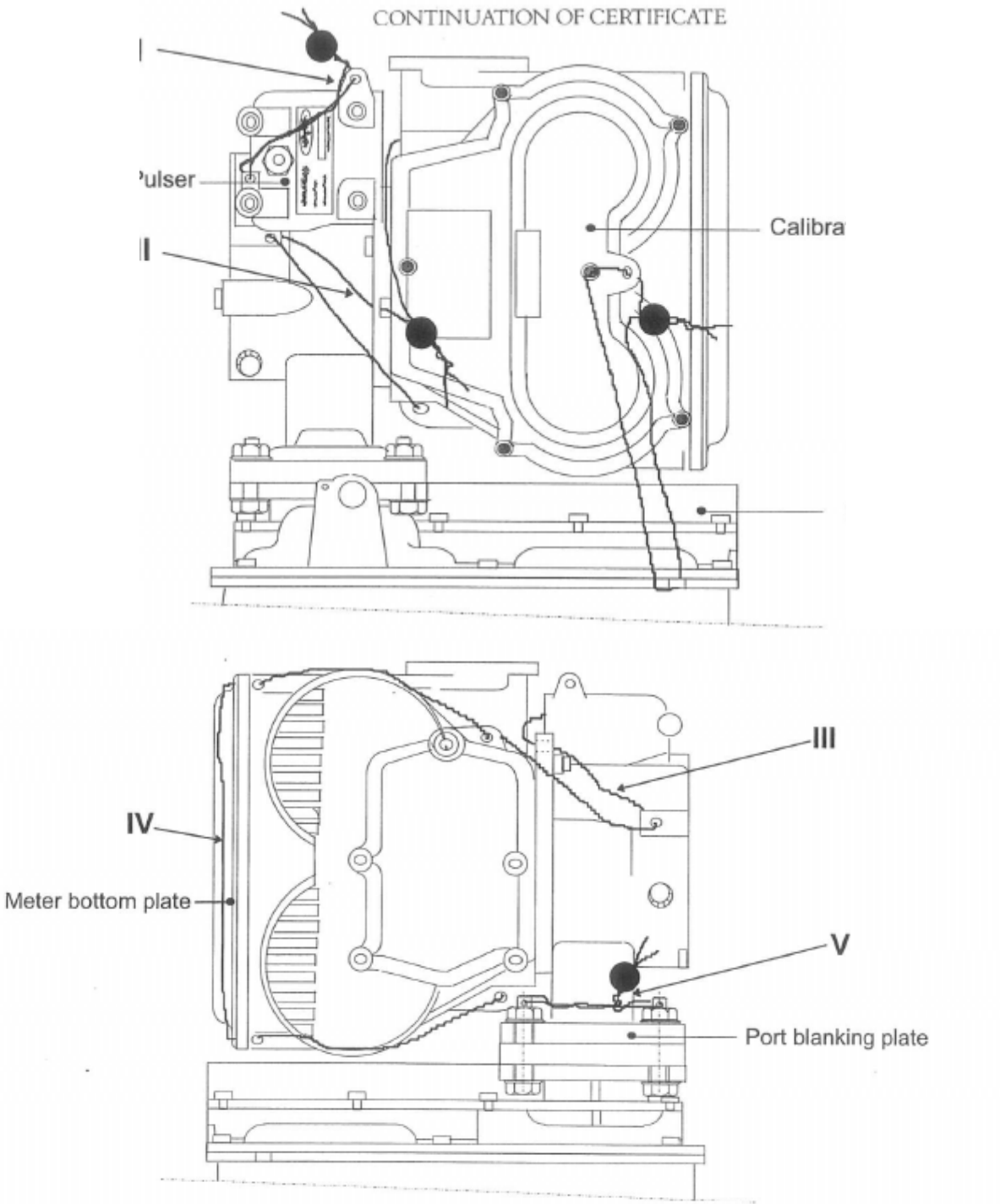


Figure 28 Alternative Tokheim hydraulic unit PAS V3 Sealing

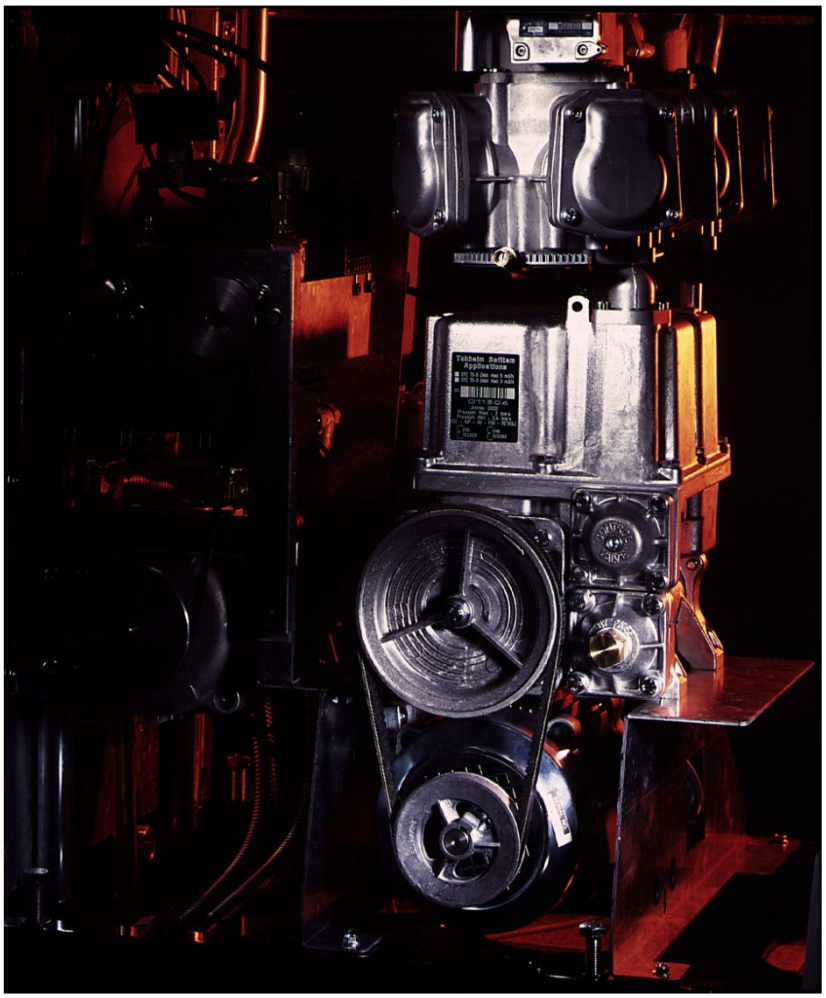


Figure 29 EPZ pump and air separator

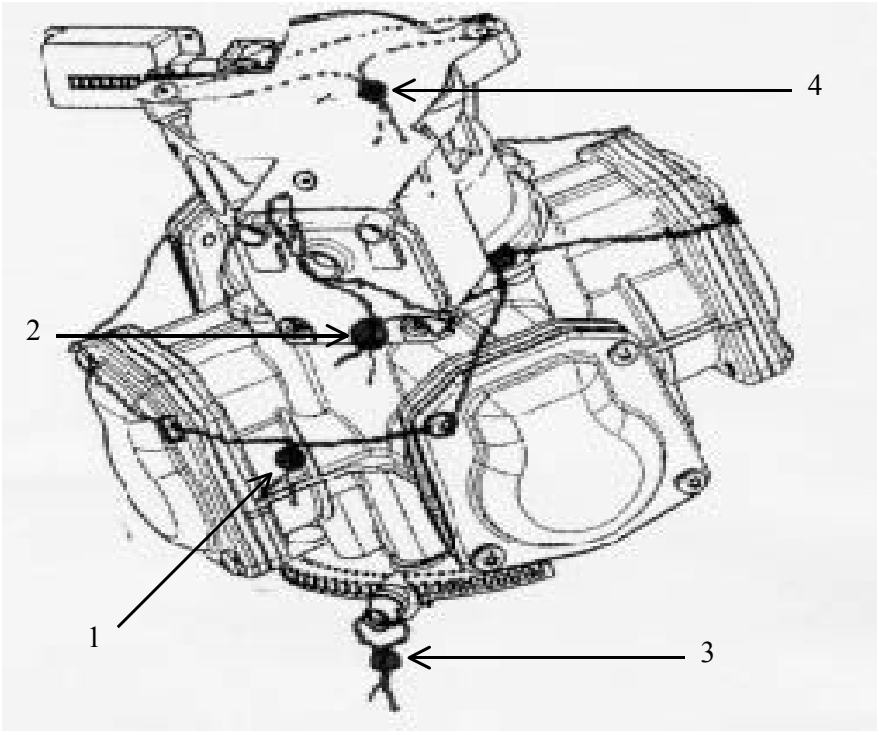


Figure 30 MA26 meter and MP-T1 pulser combination sealing arrangement

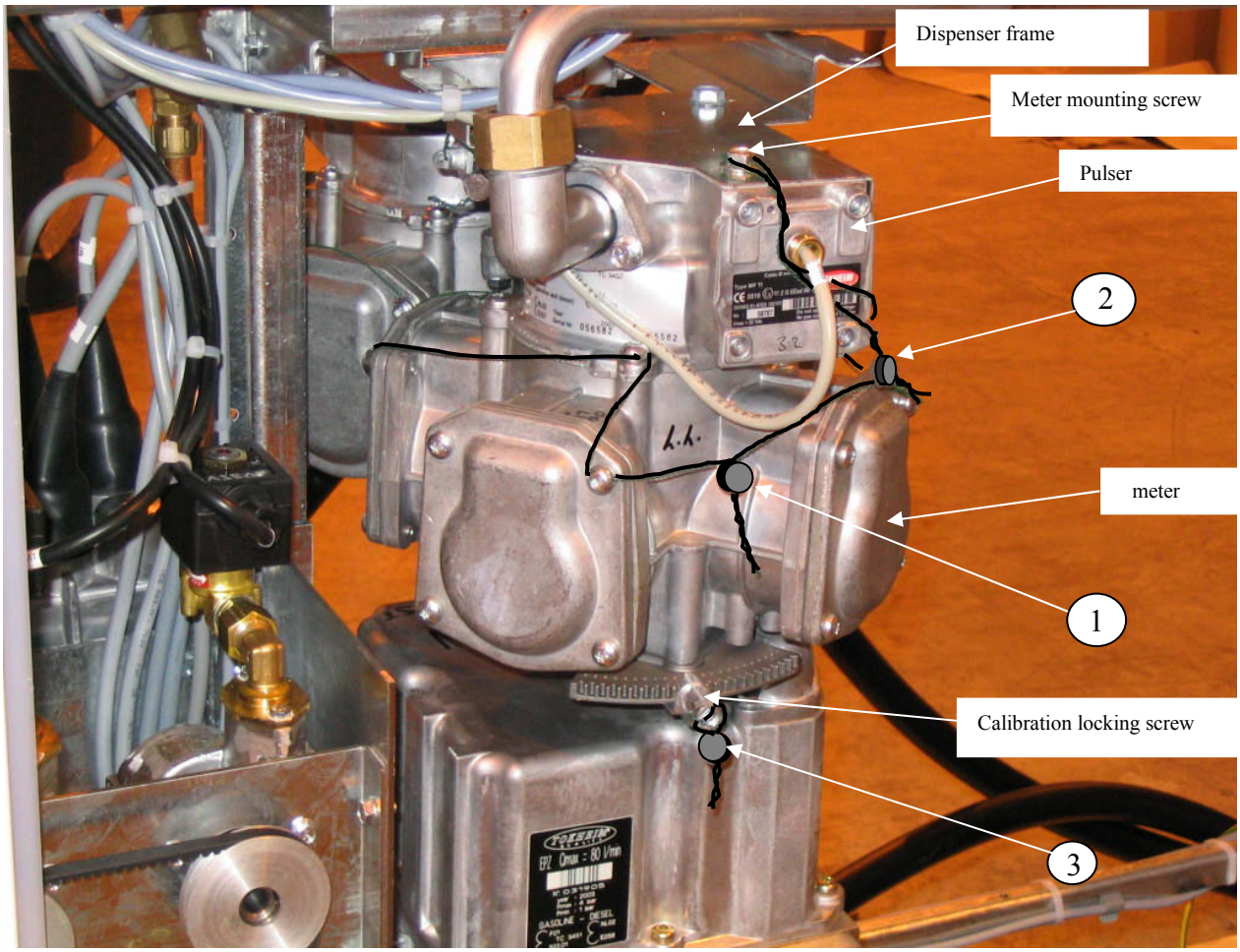


Figure 31 MA 26 meter and MP-T1 pulser combination sealing arrangement

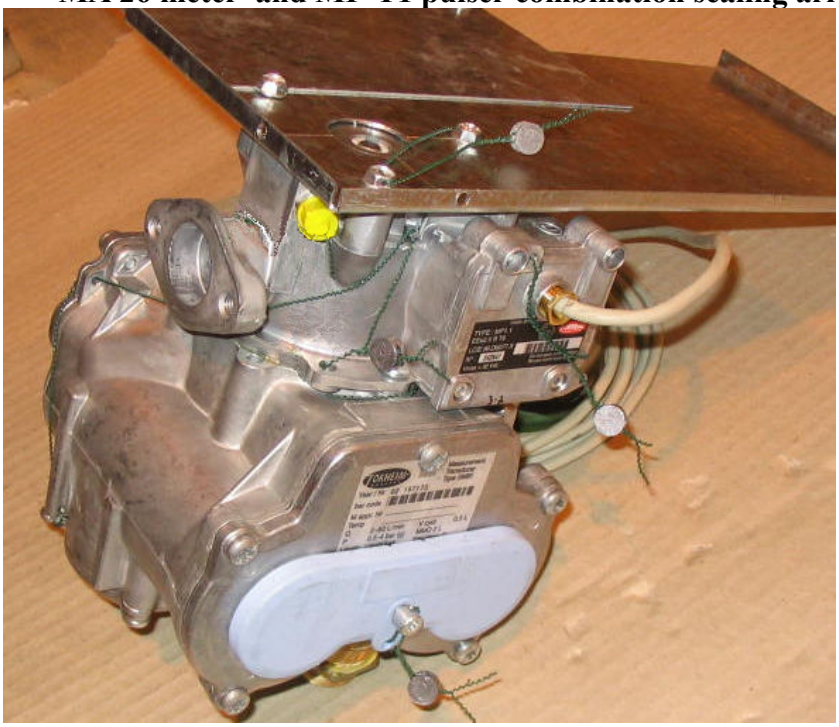


Figure 32 SM80 meter and MP-T1 pulser combined sealing diagram

Figure 33 TQP pumping unit and TM80 meter

Figure 34 The TQM meter

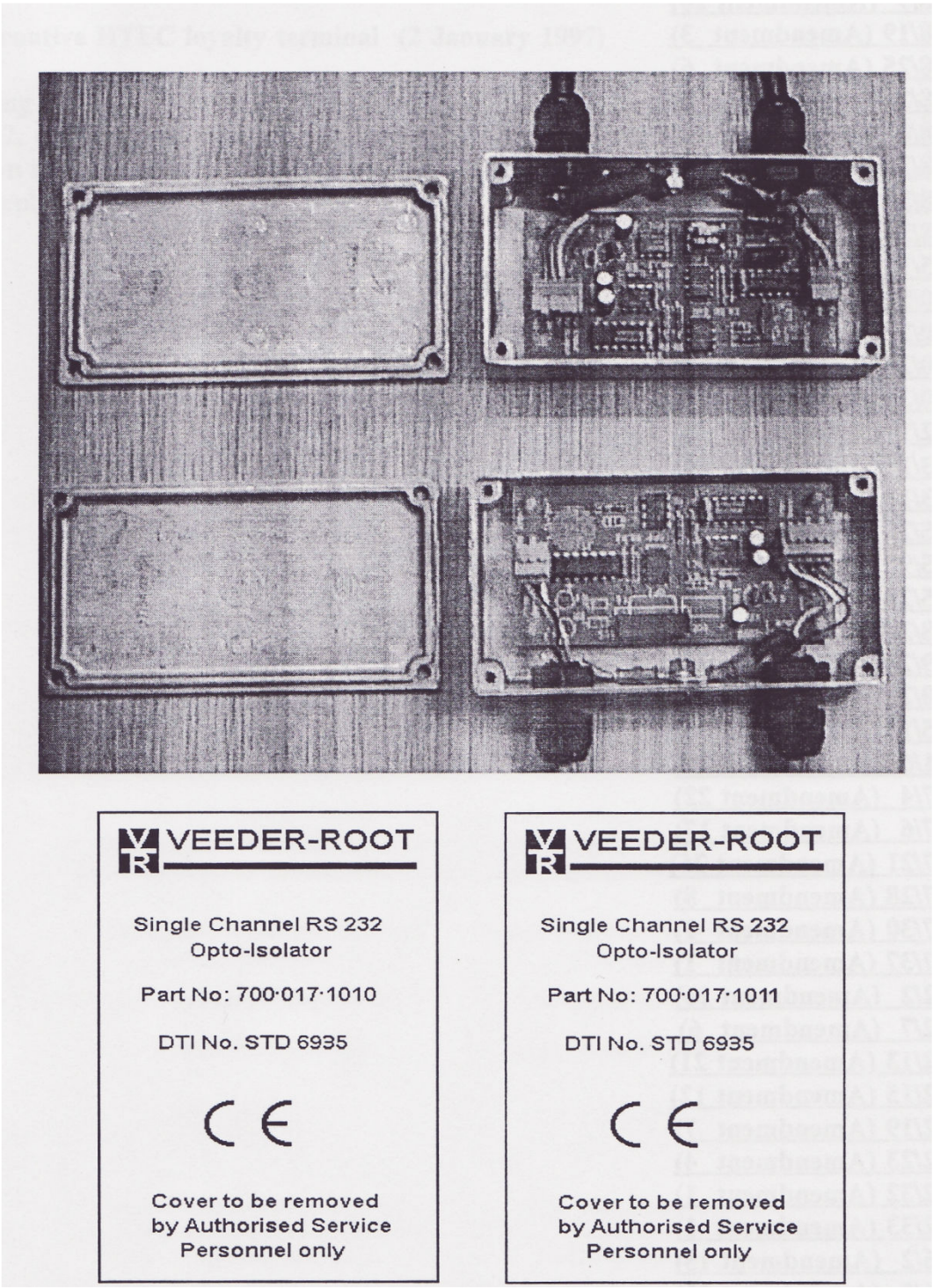


Figure 35 Opto isolators and labels

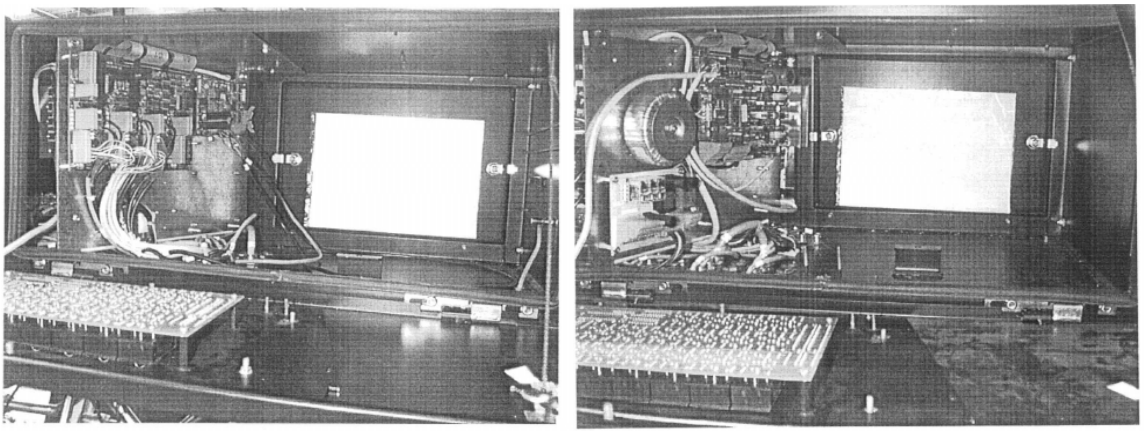


Figure 36 WWC Internal views

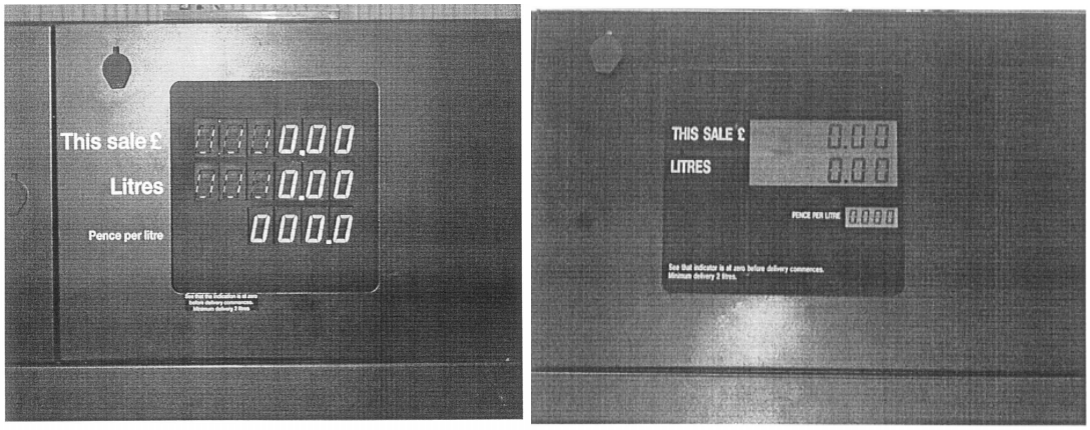


Figure 37 WWC Displays

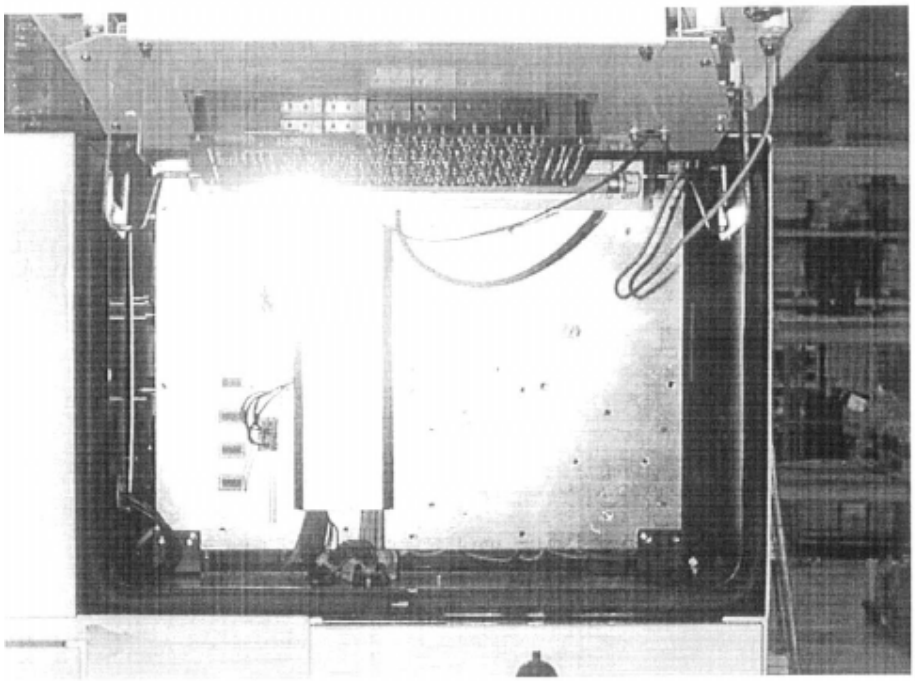


Figure 38 WWC-T1
(Calculator Chassis/plate and input cable cover)

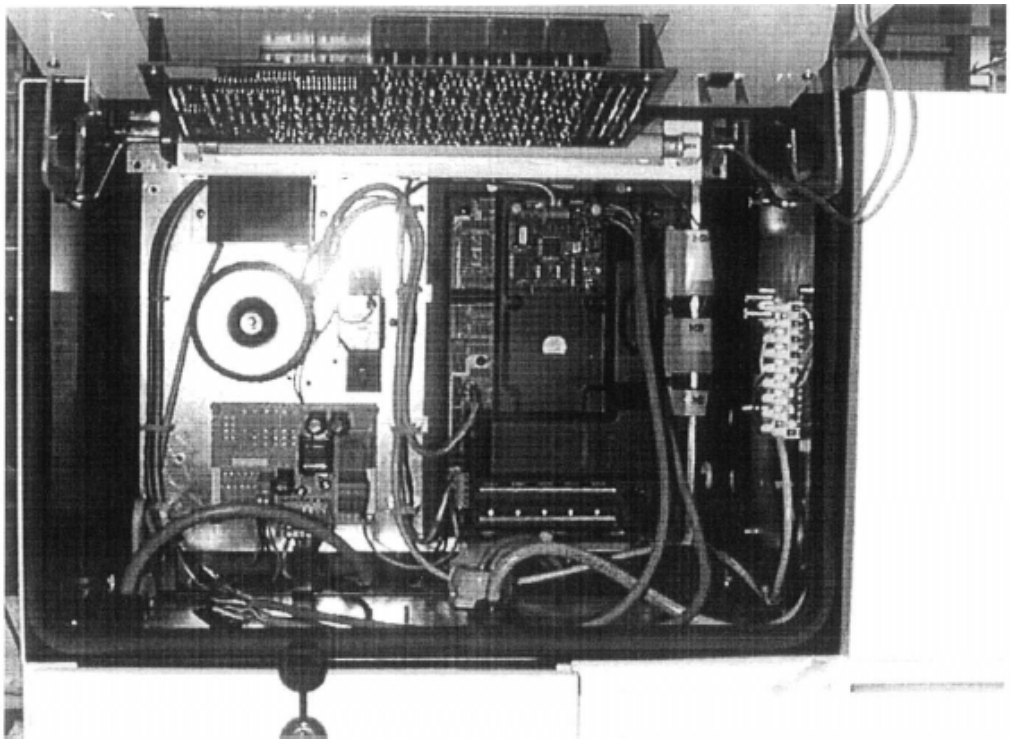


Figure 39 WWC-T1
(Showing power supply assembly on the left and the main board plastic cover with the communication adapter board positioned outside of it on the right)

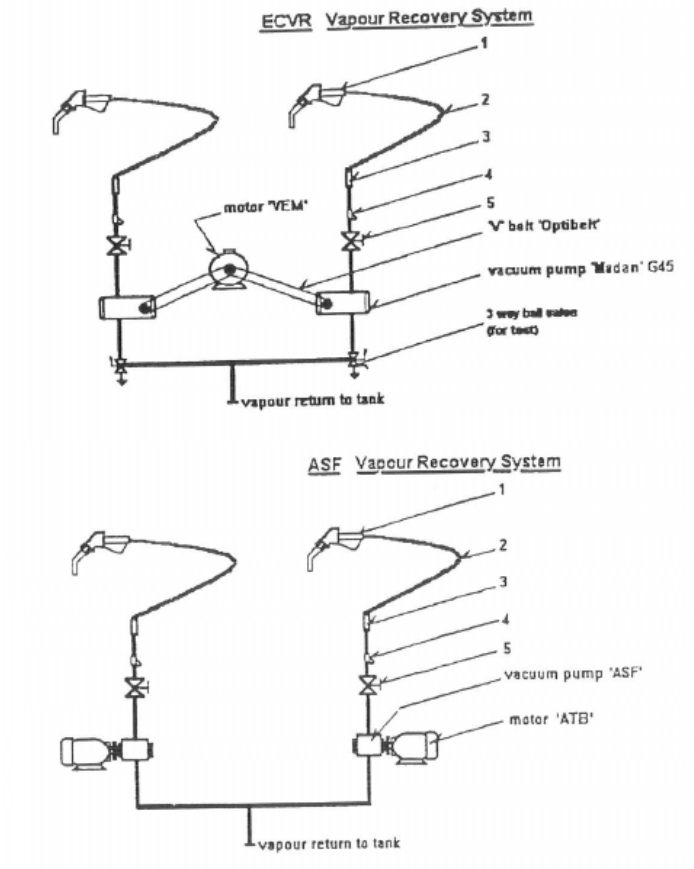


Figure 40a ECVR or ASF Vapour Recovery System

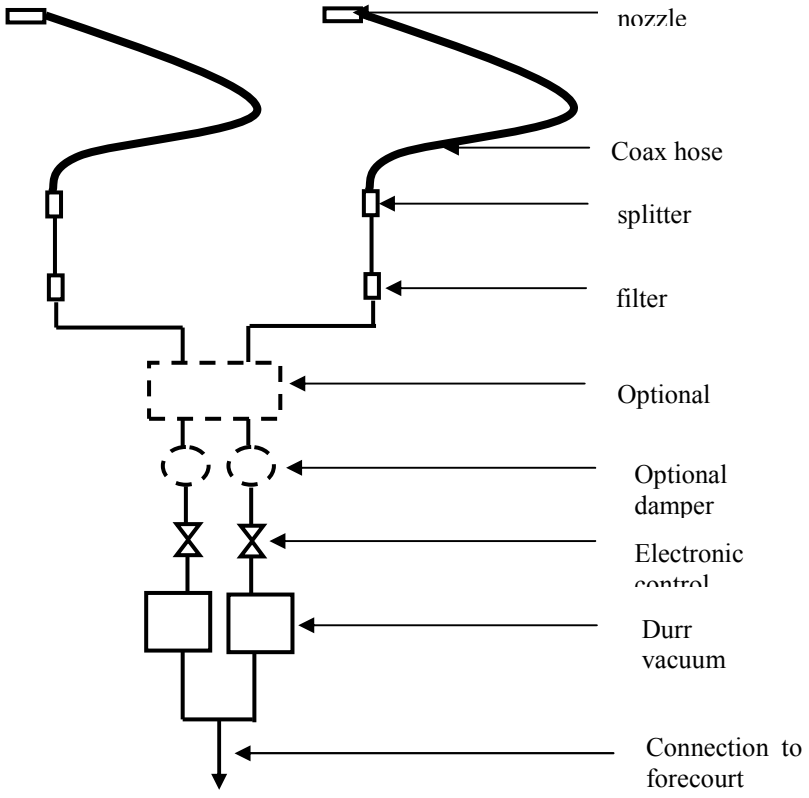


Figure 40b ECVR or ASF Vapour Recovery System With Durr Pumping unit

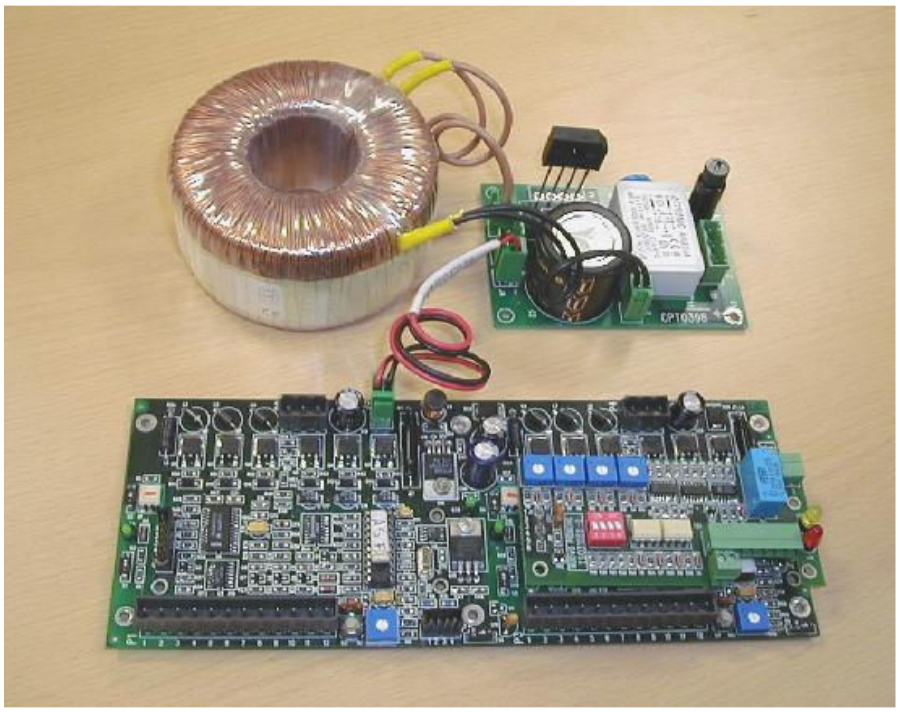


Figure 41 Vapour recovery module (open frame version) with associated power supply board

Figure 42 Vapour recovery module (explosion proof version)

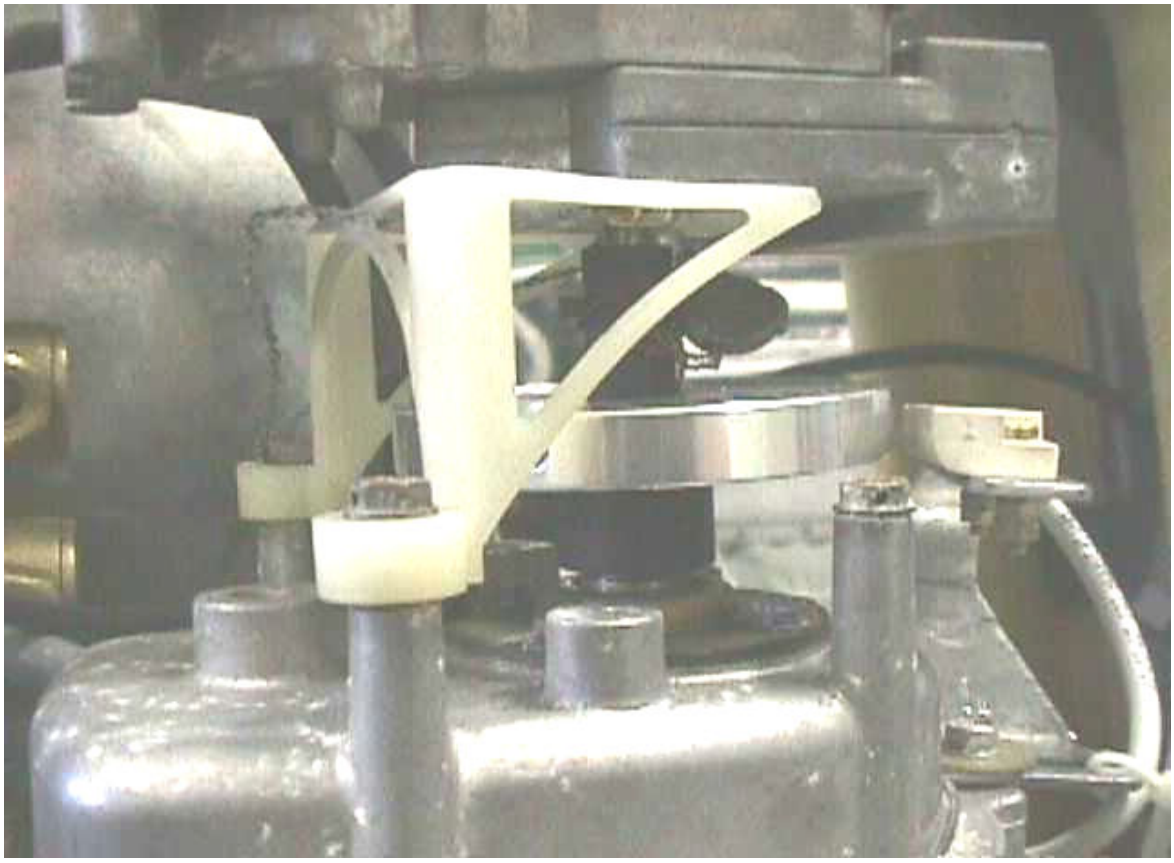
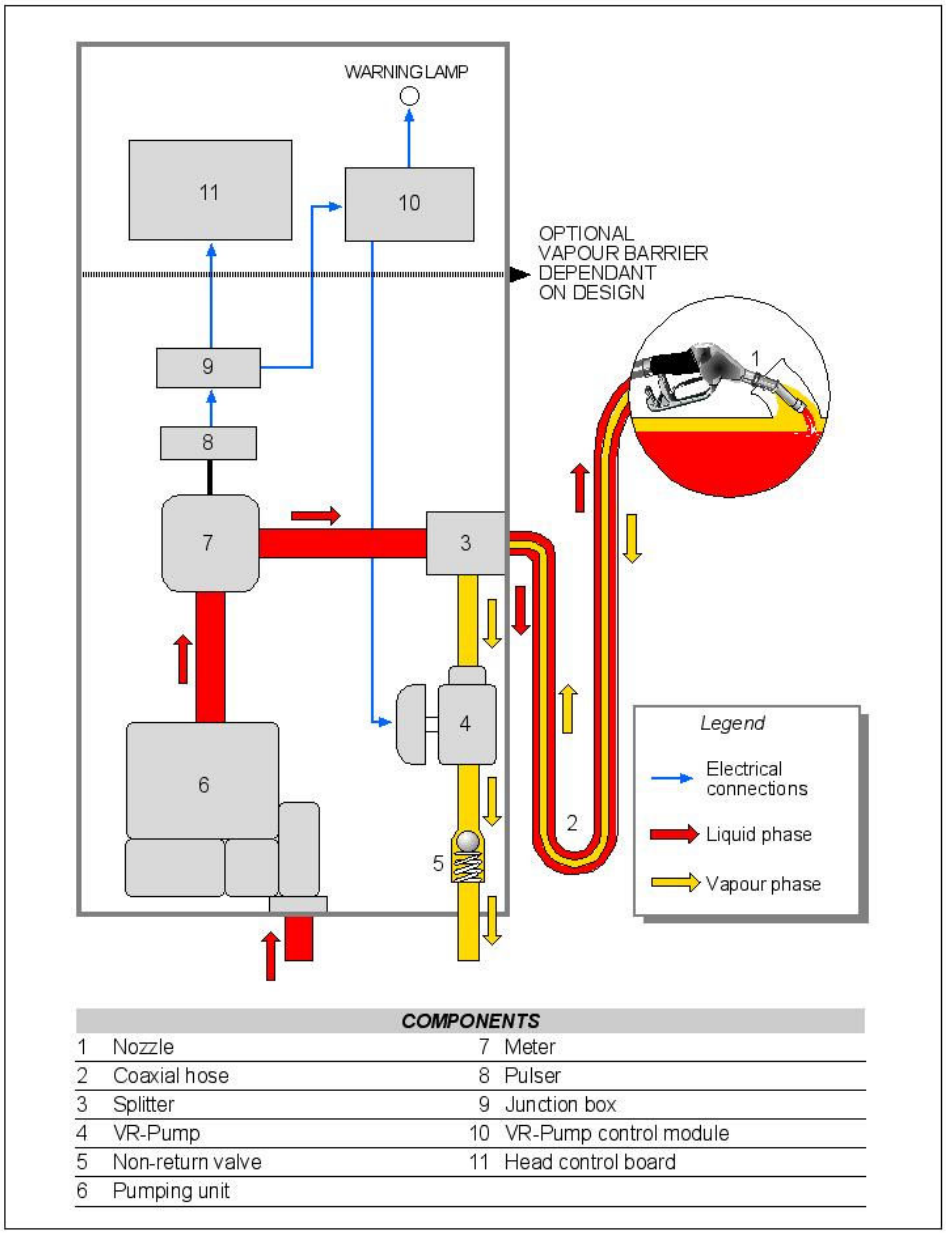
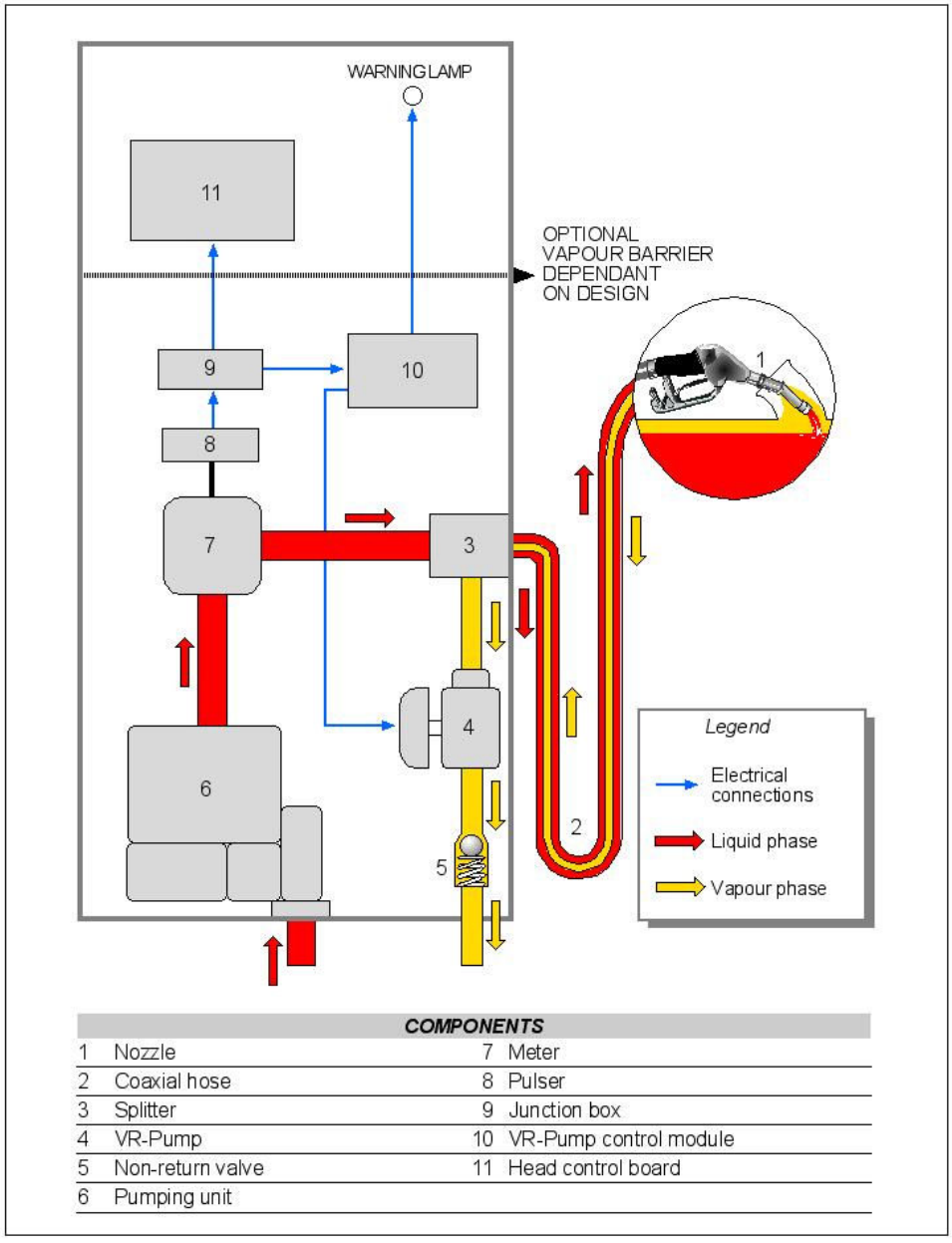


Figure 43 Magnetic encoder shown fitted between meter and pulser



COMPONENTS			
1	Nozzle	7	Meter
2	Coaxial hose	8	Pulser
3	Splitter	9	Junction box
4	VR-Pump	10	VR-Pump control module
5	Non-return valve	11	Head control board
6	Pumping unit		

Figure 44 Schematic for vapour recovery system (open frame version)



COMPONENTS			
1	Nozzle	7	Meter
2	Coaxial hose	8	Pulser
3	Splitter	9	Junction box
4	VR-Pump	10	VR-Pump control module
5	Non-return valve	11	Head control board
6	Pumping unit		

Figure 45 Schematic for vapour recovery system (explosion proof version)

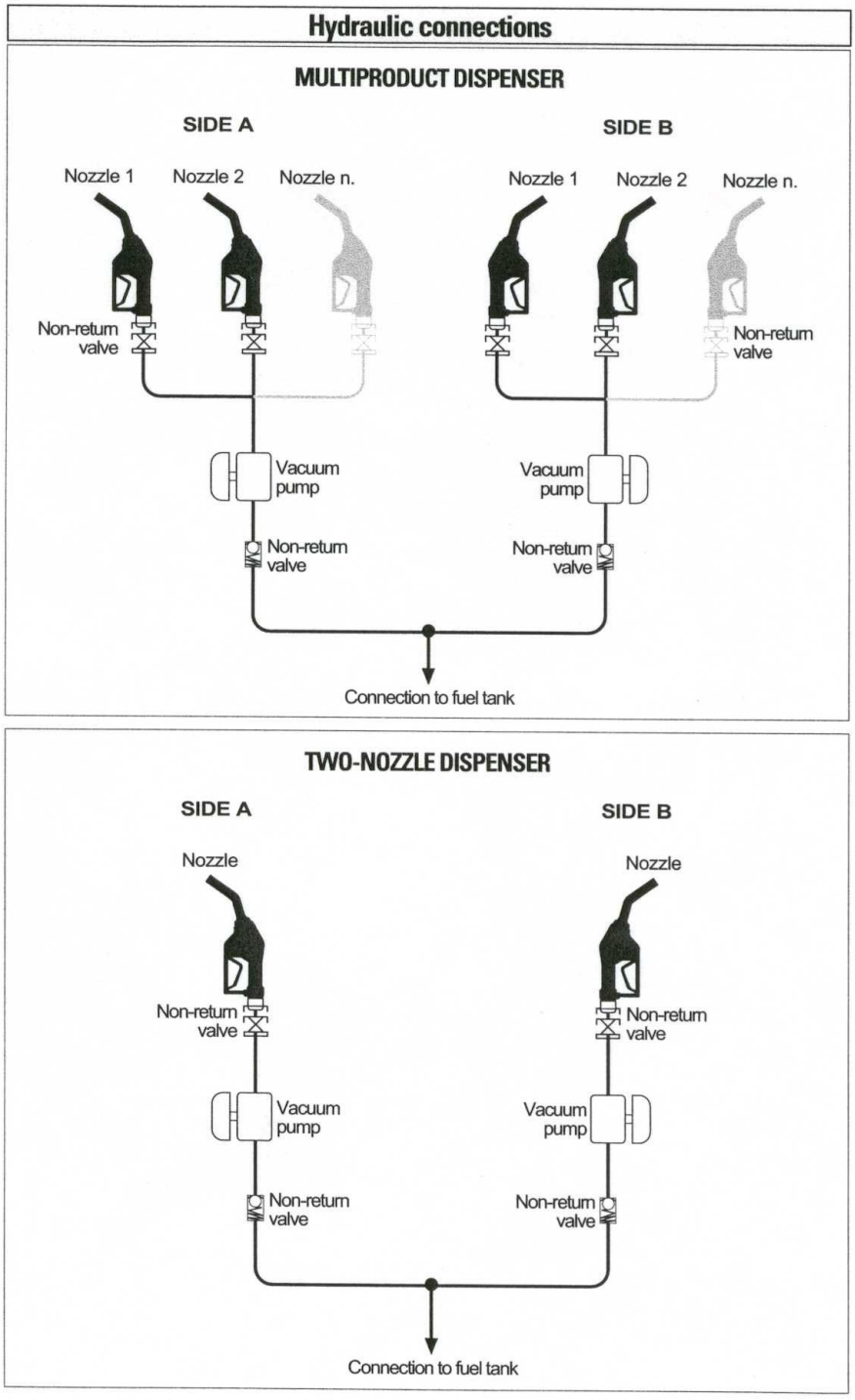


Figure 46 Schematic for vapour recovery hydraulic connections

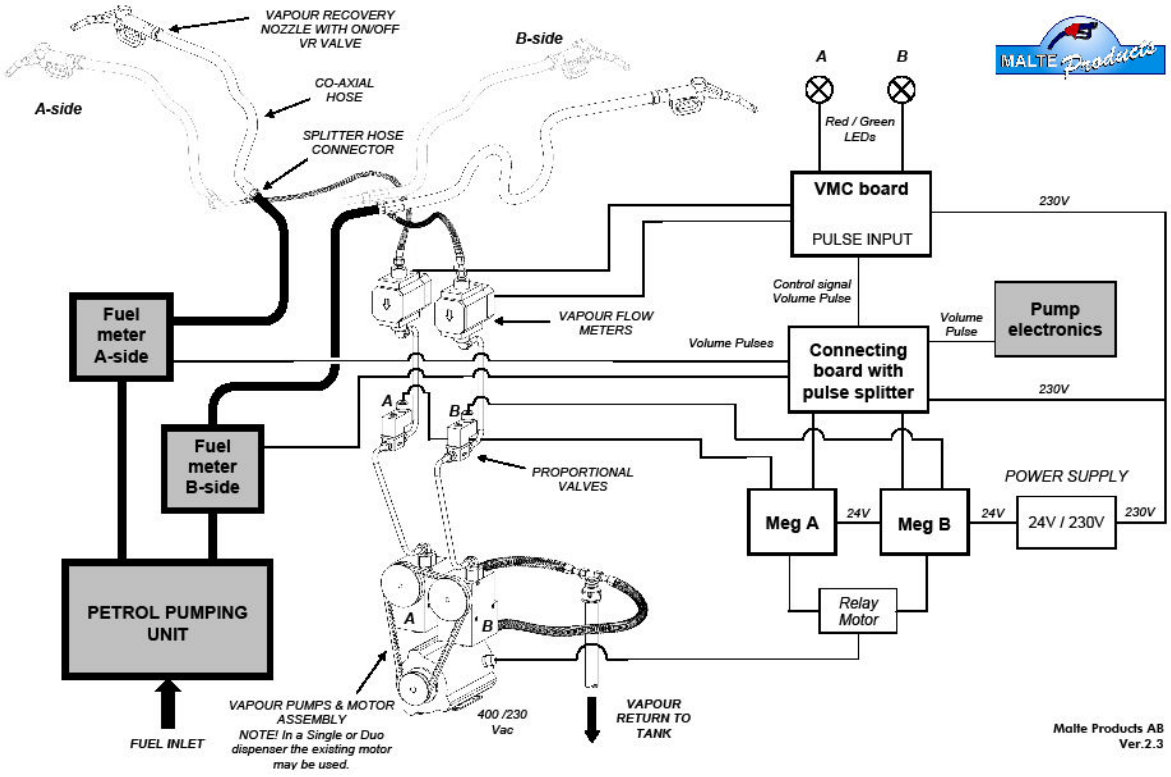


Figure 47 Schematic of vapour recovery system with monitoring

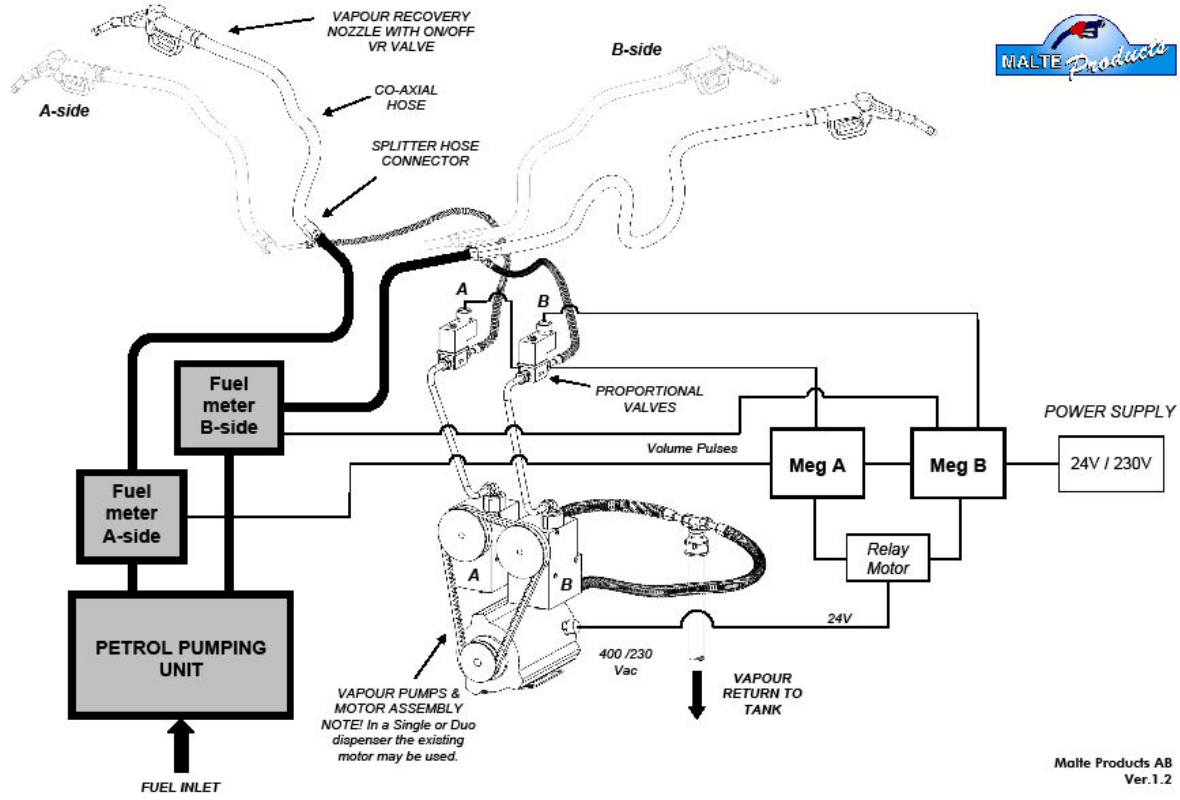


Figure 48 Schematic of vapour recovery system without monitoring

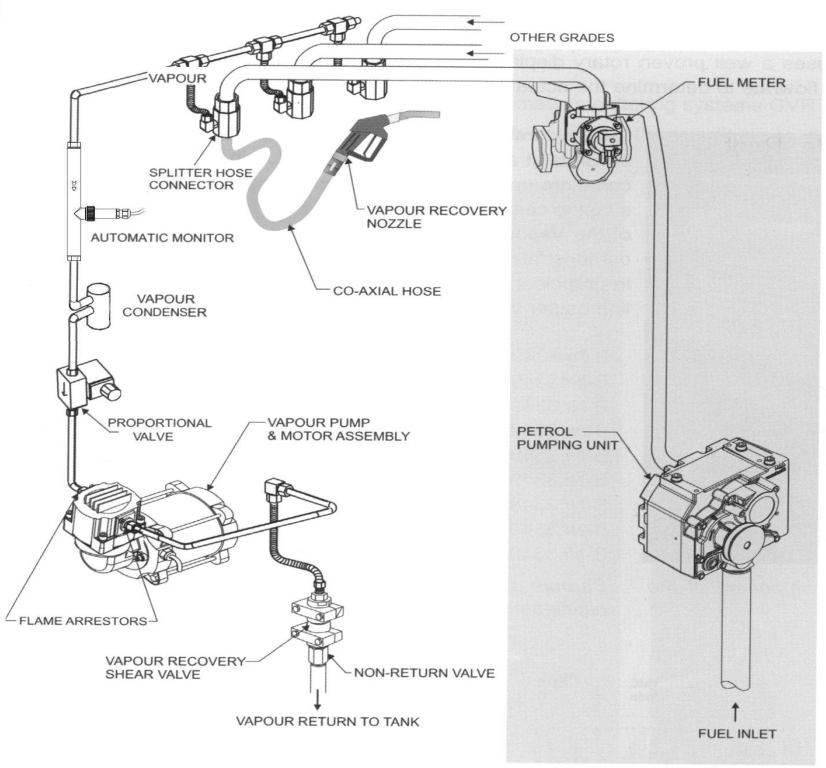


Figure 49 Schematic of vapour recovery system with monitoring

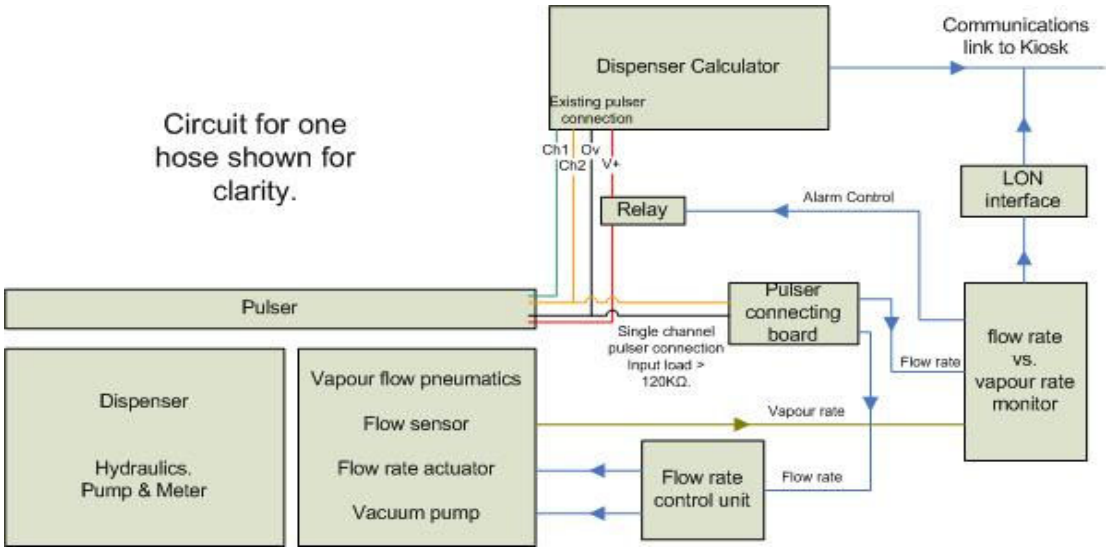


Figure 50 Electrical Block Diagram of System

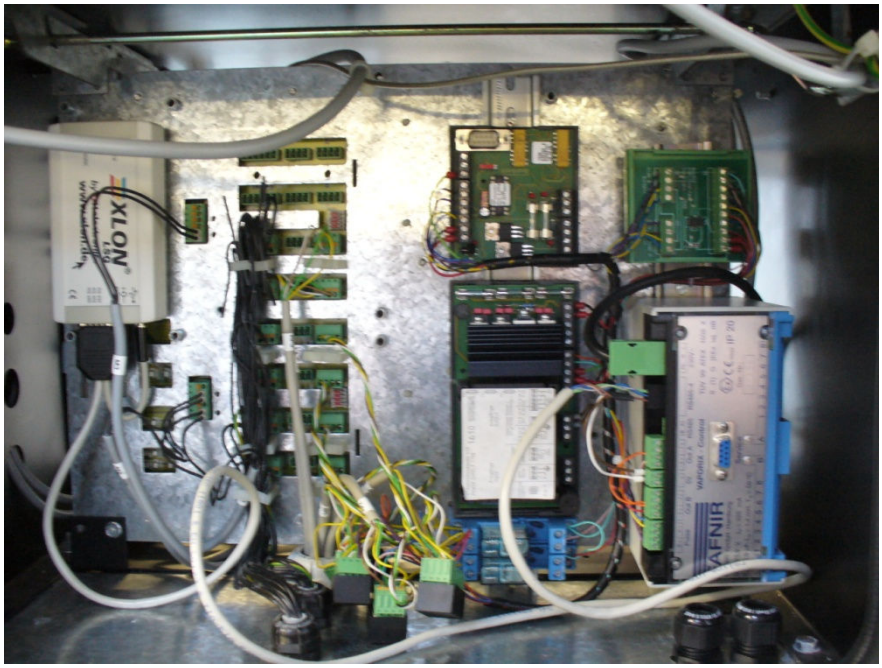


Figure 51 Electronic Installation of Automatic Monitoring System

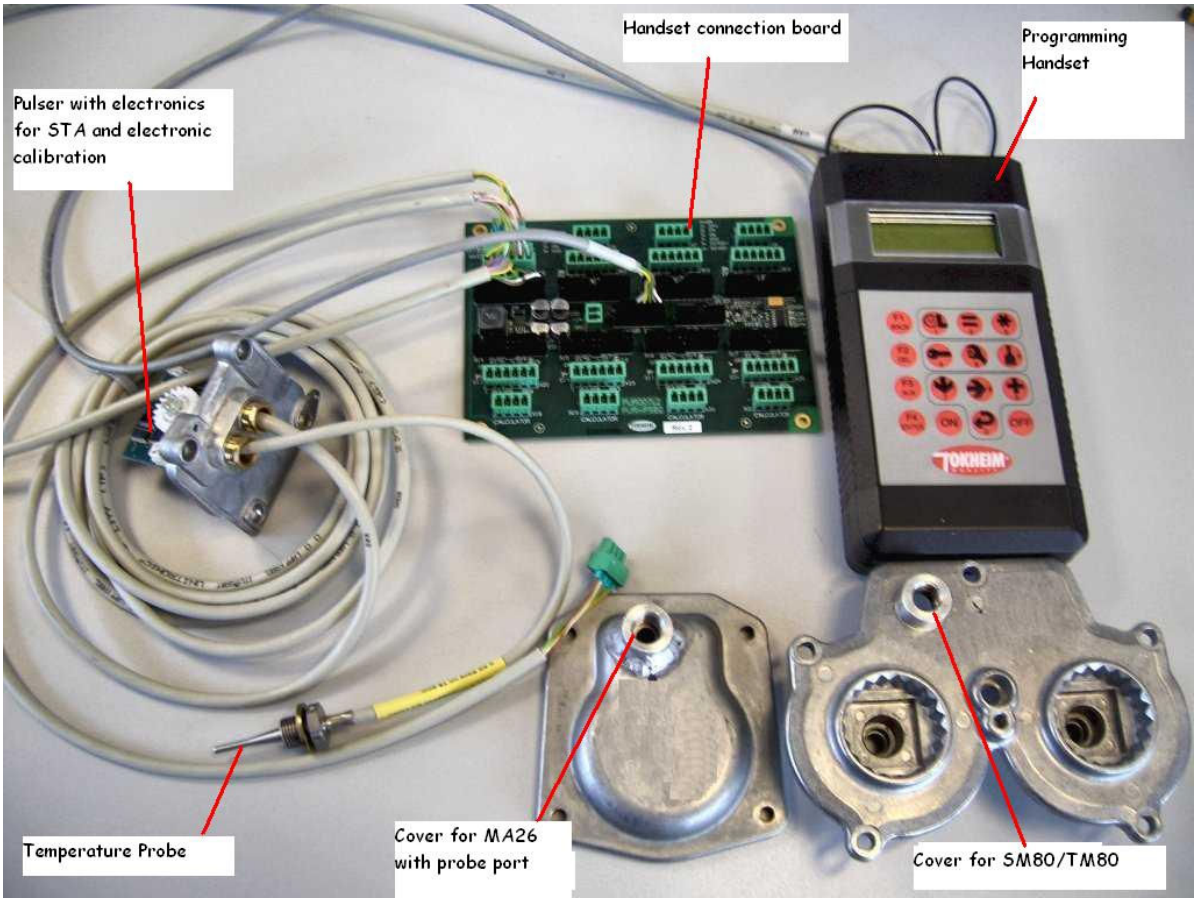


Figure 52 Volume conversion (temperature compensation) components

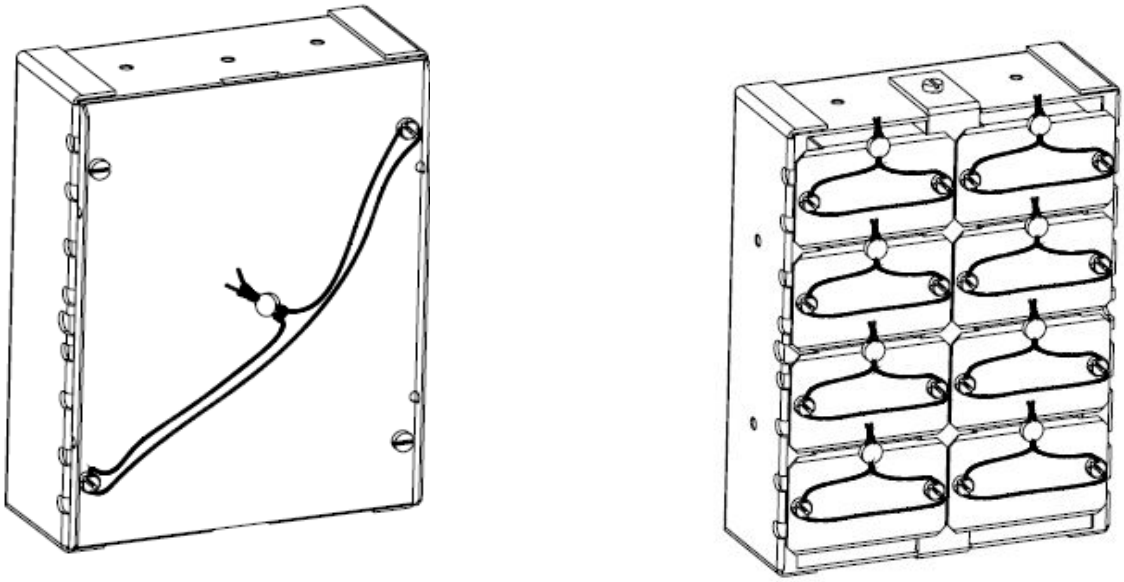


Figure 53 Pulser sealing box (PSB) - single seal and multiple seal versions

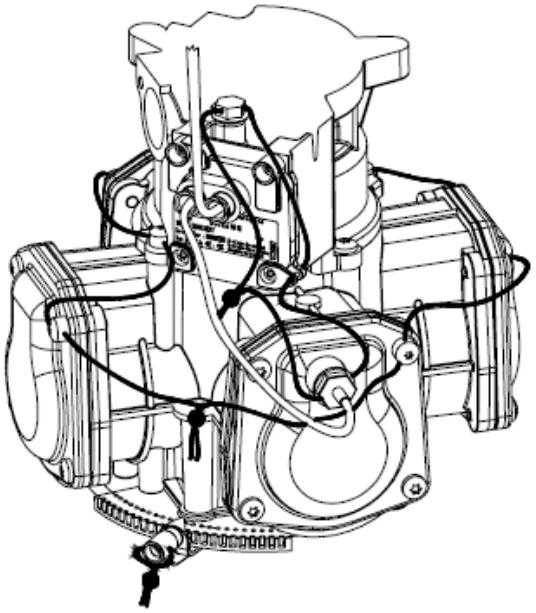


Figure 54 MA26 meter sealing with temperature probe

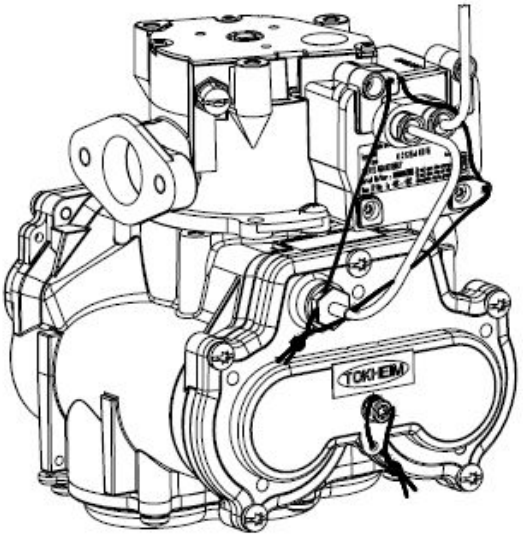
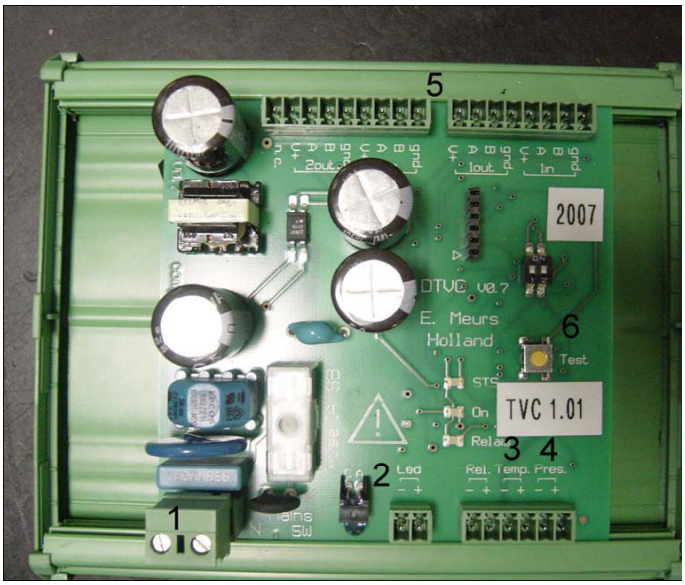


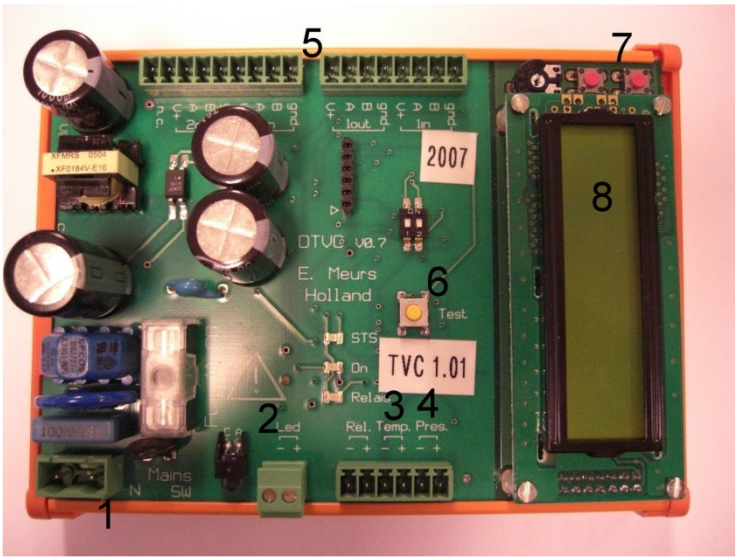
Figure 55 SM80/TM80/TQM sealing with probe



KEY:

1 Power Supply connection 230V
2 Infrared Port for Data communication
3 Temperature sensor connection
4 Density block connection
5 Pulser channel connection
6 Calibration button TVC system on/off

Figure 56 TVC unit without LCD display



Key:
1 Power Supply connection 230V
2 Infrared Port for Data communication
3 Temperature sensor connection
4 Density block connection
5 Pulser channel connection and Calculator connection
6 Calibration button TVC system on/off
7 Scroll function for display information
8 Display

Figure 57 TVC unit with LCD display

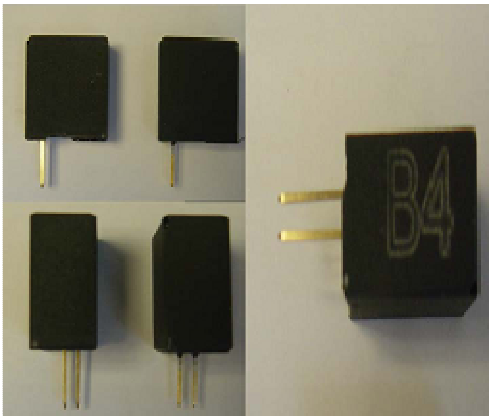


Figure 58 Density blocks

Figure 59 Temperature sensor: LM335

Figure 60 Typical installation of temperature sensor

Figure 61 TVC unit sealing arrangement

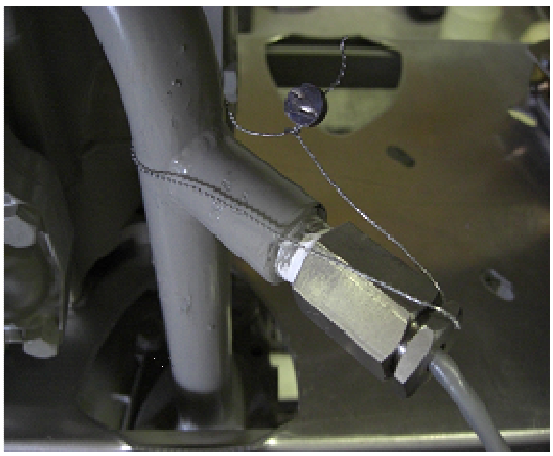


Figure 62 Typical installation of temperature sensor and sealing arrangement

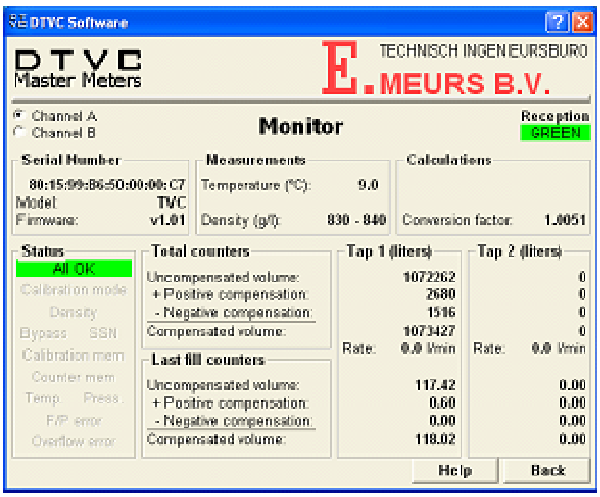


Figure 63 Typical display of measurement data using 'Fuel Monitor' software