5/1/5
18 August 2009

Australian Government

National Measurement Institute

Bradfield Road, West Lindfield NSW 2070

Cancellation

Certificate of Approval No 5/1/5

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that the approval for use for trade granted in respect of the

Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

submitted by Liquip International Pty Limited
13 Hume Road
Smithfield NSW 2164

has been cancelled in respect of new instruments as from 1 September 2009.

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

Australian Government

National Measurement Institute

Bradfield Road, West Lindfield NSW 2070

Certificate of Approval

No 5/1/5

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the

Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

submitted by Liquip International Pty Limited
13 Hume Road
Smithfield NSW 2164.

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI R 117-1, Measuring Systems for Liquids Other than Water, dated July 2004.

CONDITIONS OF APPROVAL

This approval becomes subject to review on 1 June 2008, and then every 5 years thereafter.

Instruments purporting to comply with this approval shall be marked with approval number ‘NSC 5/1/5’ and only by persons authorised by the submittor.

Instruments purporting to comply with this approval and currently marked ‘NSC P5/1/5’ may be re-marked ‘NSC 5/1/5’ but only by persons authorised by the submittor.

…./2

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

The National Measurement Institute reserves the right to examine any instrument or component of an instrument purporting to comply with this approval.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificate No S1/0/A.

DESCRIPTIVE ADVICE

Pattern: provisionally approved 9 July 2002
approved 6 May 2003

- A Liquip Sales model Diptronic Mark I static volume measuring system for road tankers. May also be known as Liquip or Liquip International instruments of the same model.

Technical Schedule No 5/1/5 describes the pattern.

Variant: approved 29 July 2005

1. As an interruptible system with a hose reel and nozzle.

Technical Schedule No 5/1/5 Variation No 1 describes variant 1.

Variant: approved 25 September 2006

2. Model Diptronic Mark II system.

Technical Schedule No 5/1/5 Variation No 2 describes variant 2.

Variants: approved 12 December 2006

3. For use with fertiliser products.

4. With a branched outlet between the pump and the non-return valve.

Technical Schedule No 5/1/5 Variation No 3 describes variants 3 and 4.

Variant: approved 13 June 2007

5. For use with cooking oils.

Variants: approved 13 September 2007

6. For use to dispense petrol which may include up to 10% ethanol.

7. For use to dispense biodiesel fuels.

Technical Schedule No 5/1/5 Variation No 4 describes variants 5 to 7.

…./3

Variant: approved 15 February 2008

8. With a branched outlet and without a level sensor.

Technical Schedule No 5/1/5 Variation No 5 describes variant 8.

FILING ADVICE

Certificate of Approval No 5/1/5 dated 14 September 2007 is superseded by this Certificate, and may be destroyed. The documentation for this approval now comprises:

Certificate of Approval No 5/1/5 dated 21 February 2008
Technical Schedule No 5/1/5 dated 1 August 2003 (incl. Test Procedure)
Technical Schedule No 5/1/5 Variation No 1 dated 24 October 2005
Technical Schedule No 5/1/5 Variation No 2 dated 18 October 2006 (incl. Notification of Change)
Technical Schedule No 5/1/5 Variation No 3 dated 8 February 2007
Technical Schedule No 5/1/5 Variation No 4 dated 14 September 2007 (incl. Notification of Change)
Technical Schedule No 5/1/5 Variation No 5 dated 21 February 2008 (incl. Notification of Change)
Notification of Change No 1 dated 10 February 2005
Figures 1 to 4 dated 1 August 2003
Figures 5 to 7 dated 24 October 2005
Figures 8 and 9 dated 8 February 2007
Figure 10 dated 14 September 2007

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

TECHNICAL SCHEDULE No 5/6B/71B

Pattern: Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

Submittor: Liquip Sales Pty Ltd
13 Hume Road
Smithfield NSW 2164

1. Description of Pattern

The pattern is a Liquip Sales model Diptronic Mark I static volume measuring system for road tankers. The system determines the volume of petroleum product (other than LPG) contained in the non-pressurised tank or compartment and measures partial transfers by calculating the difference between the initial volume and the final volume.

1.1 Field of Operation

- The instrument may replace any other dipstick approved for a vehicle-mounted tanker.
- The system is approved for deliveries not less than 200 L. The minimum quantity is indicated by the instrument as determined (and marked) for each tank at verification/certification.
- The system is approved for indicating the transfer of petroleum product (other than LPG) either to the tank or from the tank.
- Temperature operating range is –25°C to 55°C.
- Instrument voltage operating range is 9 to 30 V DC.

Note: The Diptronic Mark I system is a radar measuring device and is required to be calibrated and used with liquids of similar dielectric constant e.g. petrol, kerosene and distillate.

1.2 System Design

The Diptronic system (Figure 1) comprises a Liquip Sales model DIP200 calculator/ indicator interfaced to not more than nine (9) Liquip Sales model DIP100 radar level sensors, one for each tank/compartment. The system displays the minimum measured quantity for each tank defined by the quantity between the outlet valve of the tank (the transfer point) and the lowest level measured by the radar sensor.

The instrument is calibrated to indicate the volume contained in the tank and in the pipework leading to the transfer point – the point which defines the delivery/receipt of product.

Any hose/pipework connected after the transfer point must be completely drained when the system is used for making a delivery and is kept full of liquid when the system is used for receiving the product.

1.3 Calculator/Indicator (Figure 2)

The Liquip Sales model DIP200 calculator/indicator incorporates three LCD displays. The top left display indicates the compartment number, the top right display can be programmed to indicate either volume in litres or height in millimetres, and the bottom display indicates user information/prompts during the operation or calibration of the system.

..../2

During power-up of the calculator/indicator, the software version 01.00.09 is displayed on the user indicator. With the calculator/indicator set-up to indicate volume in litres, the height of the liquid level can be displayed through the diagnostic mode by pressing simultaneously the INC and OK buttons.

1.4 Measurement Transducer

The measurement transducer is a Liquip Sales model DIP 100 radar level gauge comprising the Diptronic headwork connected to a liquid level sensor in the form of a sensor rod mounted inside a tube with liquid entry holes at the bottom of the tube (Figure 3). The Diptronic headwork, which contains the radar electronics, is mounted on the top of the tank with the level sensor positioned vertically at the volumetric centre of the tank. The mounting bolts for the Diptronic headwork have provision for sealing the device in its prescribed calibrated position. The level sensor is maintained in its vertical position with the bottom of the level sensor attached to the Liquip Sales model DIP 300 support bracket fixed to the bottom of the tank.

The level sensor has a top datum mark that can be used for checking the correct mounting position of the measurement transducer.

The level sensor can be from 0.6 to 2.5 m long to suit the tank size.

1.3 Printer

An Epson model TM-295, 24 V DC printer (Figure 4) is connected to the DIP 200 calculator/indicator for printing the initial and final volume in the tank and for printing the calculated volume transferred.

1.4 Installation

To ensure immunity from electromagnetic interference all cables are protected using ferrite beads and all devices are grounded.

1.5 Checking Facility

The system verifies data between the calculator/indicator and the probe by performing a checksum for every packet of data as per standards for HART protocol and the central processing unit raises an alarm if the probe does not respond.

1.6 Verification/Certification Provision

Provision is made for the application of a verification/certification mark.

1.7 Sealing Provision

Provision is made for the DIP100 radar level gauge to be either permanently affixed to the tank such that it couldn't be removed, or it is sealed with lead and wire.

Provision is made for the calibration buttons of the DIP 200 to be sealed.

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1.8 Markings and Notices

Each measuring system shall bear the following information, placed together either on the indicating device or on a data plate:

Pattern approval mark	NSC No 5/1/5
Manufacturer's identification mark or trade mark	…..
Model number	…..
Serial number	…..
Year of manufacture	…..
Maximum temperature of the liquid T_{max}	….. ^{o}C
Minimum temperature of the liquid T_{min}	….. ^{o}C
Maximum volume (*)	….. Litres
Minimum volume (*)	….. Litres
Environmental class	class I

(*) Determined at verification/certification.

In addition, the type of liquid and the minimum measured quantity for each tank/ compartment are indicated/marked.

TEST PROCEDURE

The measuring system can be verified/certified using the procedures given in NSC Document 120 Annex C for the level gauge, and Document 124 appendix 1 for the tank (based on OIML R85 and R71 respectively).

The maximum permissible errors, that is, the difference between the volume transferred as indicated by the instrument and the transferred volume measured using traceable equipment, are:

±0.5% for the measuring system (in-service inspection); and

±0.3% during calibration adjustment of the instrument.

The verification/certification may be carried out by either delivering a traceable volume into the diptronic-tank, or alternatively by dispensing the liquid from the diptronic-tank via traceable volume measuring equipment.

Within the field of operation, the reference equipment must be able to measure the volume at any level in the diptronic-tank with sensitivity at least three times better than a volume equivalent to ±1 mm change in liquid level.

Up to 200 calibration points can be entered to define the tank profile (height versus volume). The tank profile shall be determined at an appropriate number of intervals to ensure that for contents in the tank greater than 400 L, the interpolated volume between two adjacent calibration points is within ±0.3%.

For each tank, the calibration points shall include the minimum liquid level (rounded up to the nearest 10 L) and the maximum liquid level (rounded down to the nearest 10 L). These maximum and minimum volumes for each tank/compartment shall be indicated to the user as the operating range of the instrument.

5/1/5
24 October 2005

TECHNICAL SCHEDULE No 5/1/5

VARIATION No 1

Pattern: Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

Submittor: Liquip International Pty Limited
13 Hume Road
Smithfield NSW 2164

1. Description of Variant 1

The Liquip Sales model Diptronic Mark I static volume measuring system for road tankers, similar to the pattern, but now with software version 01.02.00 to allow communication with a process logic controller (PLC) and the system is designed to allow deliveries via a hose reel and nozzle (Figure 5).

The system includes a diverting valve, a filter/strainer, pump, hose reel and nozzle installed such that the pipework in maintained full of liquid at all times. The Liquip type DM102 diverting manifold valve is installed between the outlet of the tank and the filter/strainer to prevent deliveries whenever the tank is re-filled with liquid. The nozzle is fitted with an anti-drain valve to maintain the system full of liquid and pressurised at not less than 55 kPa.

Unlike the pattern, the Diptronic Mark I is calibrated to indicate only the contents in the tank. The quantity between the nozzle and the minimum measuring level of the electronic dipstick is determined for each system at the time of calibration and is identified on a data plate as the 'Priming Quantity' for that product.

To ensure that the level of liquid does not fall below the minimum measuring level, either:

(a) An internal float valve is installed in the supply tank (Figure 6) that stops the delivery when minimum measuring level is reached; or

(b) A liquid detector, such as the Liquip model FOB100 sensor connected to a Liquip MPP100 series monitor (Figure 7), is installed and interfaced to stop the delivery when the product level approaches the minimum measuring level of the electronic dipstick.

TECHNICAL SCHEDULE No 5/1/5

VARIATION No 2

Pattern: Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

Submittor: Liquip International Pty Limited
13 Hume Road
Smithfield NSW 2164

1. Description of Variant 2

The Liquip Sales model Diptronic Mark II static volume measuring system which is similar to the pattern but uses up to nine (9) Liquip Sales model DIP 130-12 radar level gauge measurement transducers.

The DIP130-12 measurement transducers perform the same functions as the model DIP100 devices (also known as model DIP100-12) described for the pattern but the Diptronic headwork of the model DIP130-12 contains one less printed circuit board, i.e. now three.

NOTIFICATION OF CHANGE

The following changes are made in Technical Schedule No 5/1/5 dated 1 August 2003:

(i) The heading at the top of page 1 should be amended to read;

'TECHNICAL SCHEDULE No **5/1/5**'

(ii) In clause **1.2 System Design**, the reference to 'model DIP100 radar level sensors' should be amended to read;

'model DIP100 radar level **gauges (also known as model DIP100-12**)'

(iii) The clause numbers '**1.3 Printer**' through to '**1.8 Markings and Notices**' should be amended to read ''**1.5 Printer**' through to '**1.10 Markings and Notices**', as appropriate.

TECHNICAL SCHEDULE No 5/1/5

VARIATION No 3

Pattern: Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

Submittor: Liquip International Pty Limited
13 Hume Road
Smithfield NSW 2164

1. Description of Variants

1.1 Variant 3

Similar to the pattern except that it is used for delivering fertiliser products, and has an additional tank with a DIP 130 radar level sensor that is utilised for flushing at least 50 litres of water from the transfer point to the purchaser's receiving tank. This ensures that the client has received the entire product purchased and contamination will not occur between other fertiliser products.

A printed receipt is supplied indicating the volume of fertiliser product, and water delivered.

It shall not be possible to deliver fertiliser product unless there is sufficient water in compartment number 2 to flush the system. Refer to Figure 8 for a schematic diagram of a typical system.

1.2 Variant 4

Similar to variant 1 except that it is fitted with a three-way valve situated between the pump and the hose reel (Figure 9) and used for bulk deliveries. The system is maintained full of liquid by the installation of a spring-loaded hold pressure valve; the pipework is protected from measuring air by the safeguards mentioned in the description of Variant 1, depending on the application.

TECHNICAL SCHEDULE No 5/1/5

VARIATION No 4

Pattern: Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

Submittor: Liquip International Pty Limited
13 Hume Road
Smithfield NSW 2164

1. Description of Variants

1.1 Variant 5

Similar to the pattern except that it is used for delivering cooking oils.

The variant comprises a vehicle tank with three compartments, two for fresh cooking oils and the other for waste oil.

The system may have one model DIP 200 calculator/indicator (as described for the pattern) for either one or two DIP 130 (aka 130-12) measurement transducers (as described for variant 2).

Refer to Figure 10 for a schematic diagram of a typical system with a single calculator/indicator.

1.2 Variant 6

The pattern and variants for use to dispense various grades of petrol which may include up to 10% ethanol ('E10').

1.3 Variant 7

The pattern and variants constructed for use to dispense various grades of pure biodiesel and biodiesel/distillate blends (to Australian government standard).

NOTIFICATION OF CHANGE

The following change is made in Technical Schedule No 5/1/5 dated 1 August 2003.

The first paragraph of the Test Procedure is amended as follows:

"The measuring system can be verified/certified using the procedures given in **document NMI R 85, *Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks*, and document NMI R 71, *Pattern Approval Specifications for Fixed Storage Tanks for Trade Use*** (based on OIML R85 and R71 respectively).

TECHNICAL SCHEDULE No 5/1/5

VARIATION No 5

Pattern: Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

Submittor: Liquip International Pty Limited
13 Hume Road
Smithfield NSW 2164

1. Description of Variant 8

Similar to variant 1 (being fitted with a three-way valve situated between the pump and the hose reel) however the low liquid level sensor shown in Figure 9 has been omitted.

The system is maintained full of liquid and protected from measuring air by the Diptronic itself which is programmed to signal low level to the PLC which acts through relays closing valves and disengaging the hydraulic drive to the pump.

NOTIFICATION OF CHANGE

The following change is made in:

(i) Technical Schedule No 5/1/5 dated 1 August 2003, clause **1. Description of Pattern**; and

(ii) Technical Schedule No 5/1/5 Variation No 2 dated 18 October 2006, clause **1. Description of Variant 2**;

The following text should be added after the first paragraph:

> "May also be known as Liquip or Liquip International instruments of the same model."

5/1/5
10 February 2005

Australian Government

National Measurement Institute

12 Lyonpark Road, North Ryde NSW 2113

Notification of Change
Certificate of Approval No 5/1/5
Change No 1

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

The following change is made to the approval documentation for the

Liquip Sales Model Diptronic Mark I Liquid Level Measuring System

submitted by Liquip Sales Pty Ltd
13 Hume Road
Smithfield NSW 2164.

In Certificate of Approval No 5/1/5 and its Technical Schedule, both dated 1 August 2003, all references to the submittor should be amended to read:

'Liquip International Pty Limited'

The address remains unchanged.

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

FIGURE 5/1/5 – 1

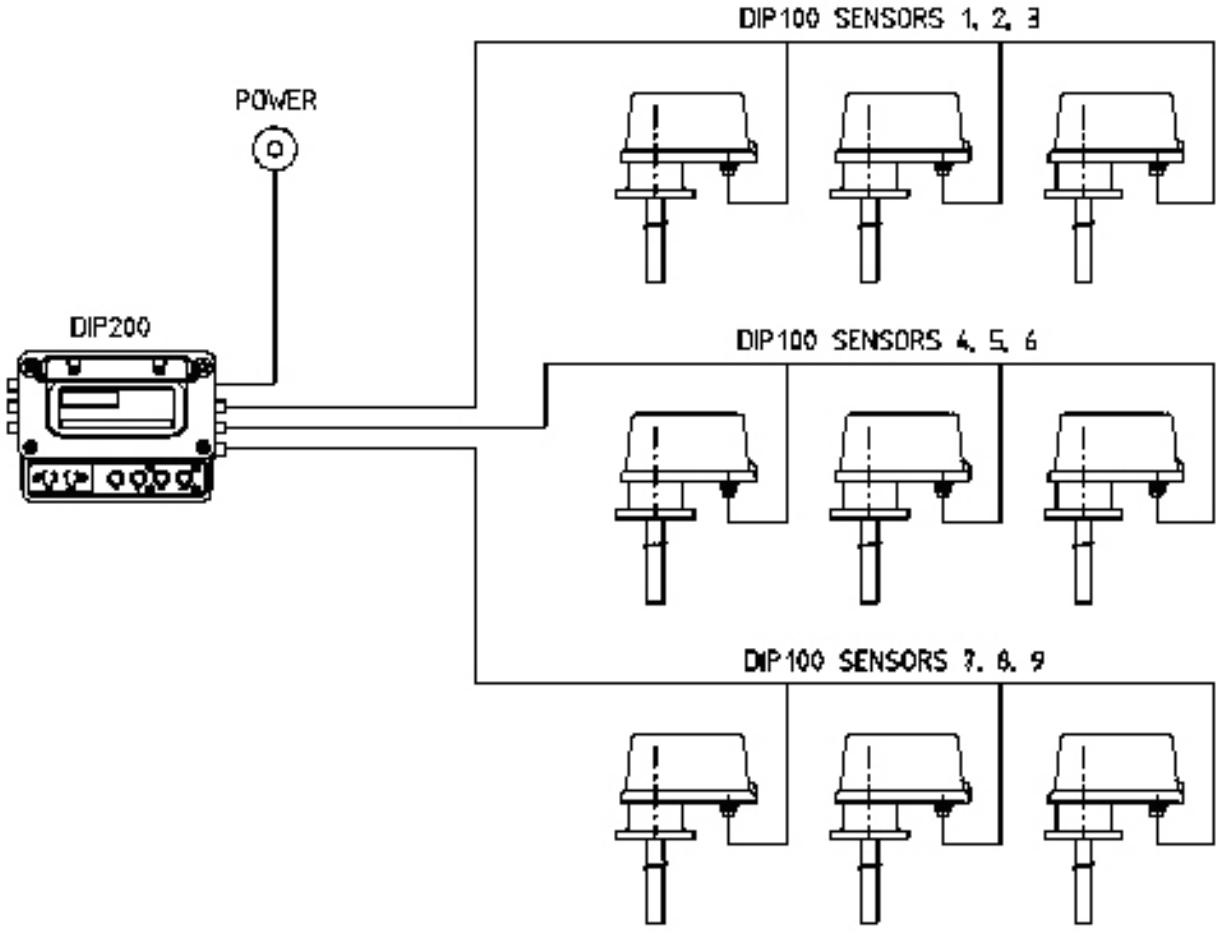
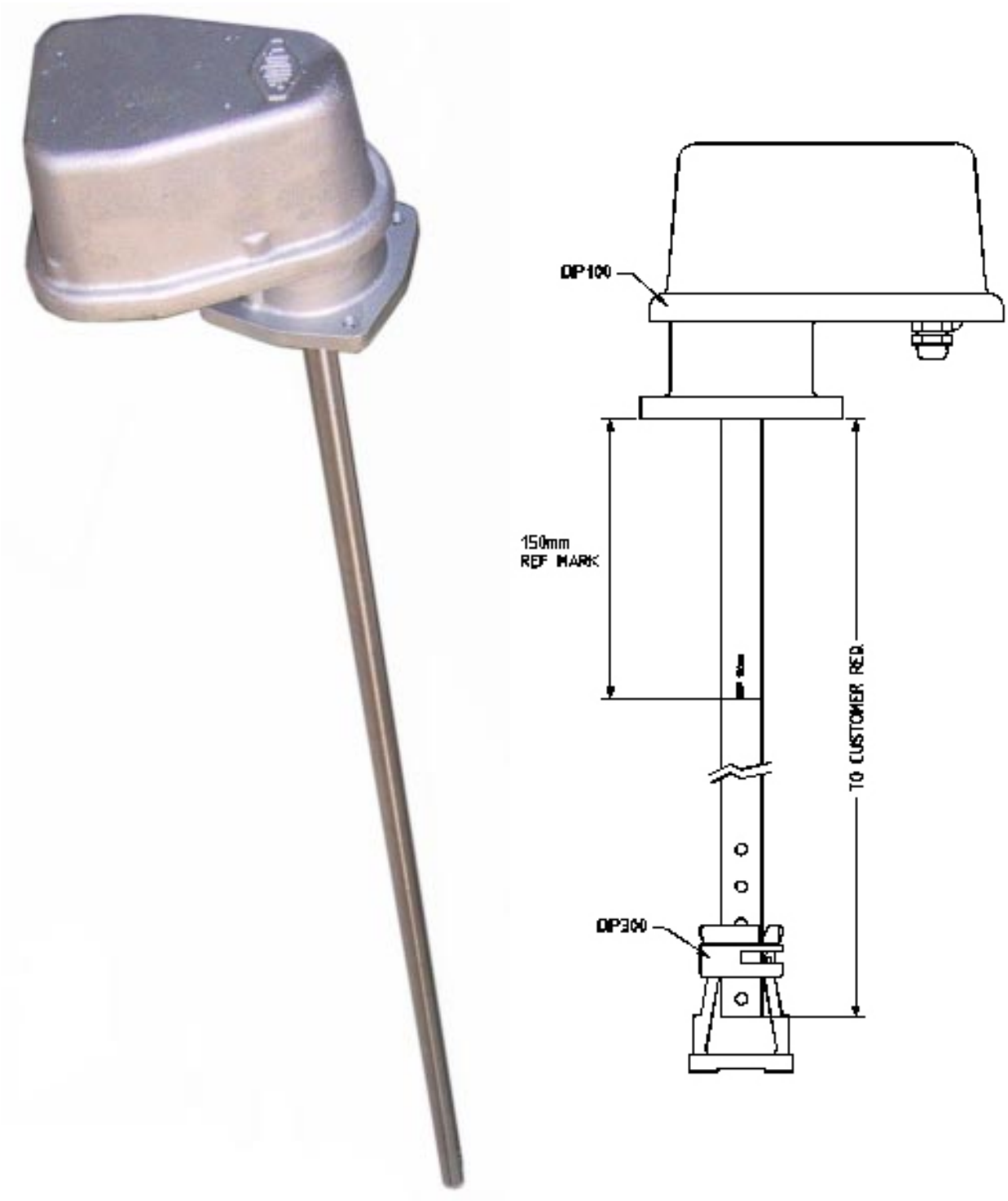

DIP100 SENSORS 1, 2, 3
POWER
DIP200
DIP100 SENSORS 4, 5, 6
DIP100 SENSORS 7, 8, 9

FIGURE 5/1/5 – 2

Liquip Sales Model DIP200 Calculator/Indicator

FIGURE 5/1/5 – 3



Liquip Sales Model DIP 100 Radar Level Gauge

FIGURE 5/1/5 – 4

Epson Model TM-295 Printer

FIGURE 5/1/5 – 5

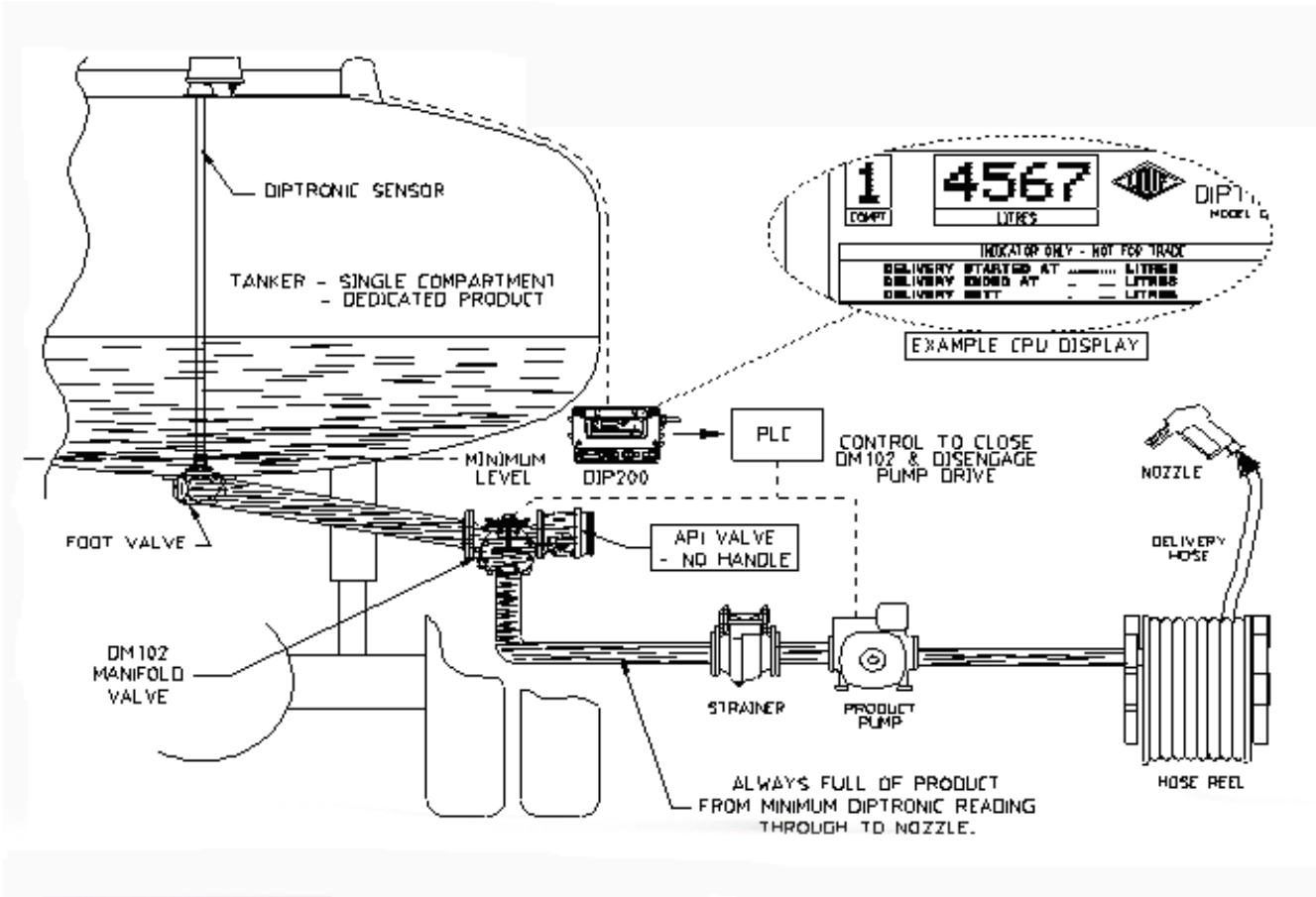

DIPTRONIC SENSOR
TANKER - SINGLE COMPARTMENT
- DEDICATED PRODUCT
1
COMPT
4567
LITRES
INDICATOR ONLY - NOT FOR TRADE
EXAMPLE CPU DISPLAY
MINIMUM
LEVEL
DIP200
PLC
CONTROL TO CLOSE
DM102 & DISENGAGE
PUMP DRIVE
NOZZLE
DELIVERY
HOSE
FOOT VALVE
API VALVE
- NO HANDLE
DM102
MANIFOLD
VALVE
STRAINER
PRODUCT
PUMP
HOSE REEL
ALWAYS FULL OF PRODUCT
FROM MINIMUM DIPTRONIC READING
THROUGH TO NOZZLE.

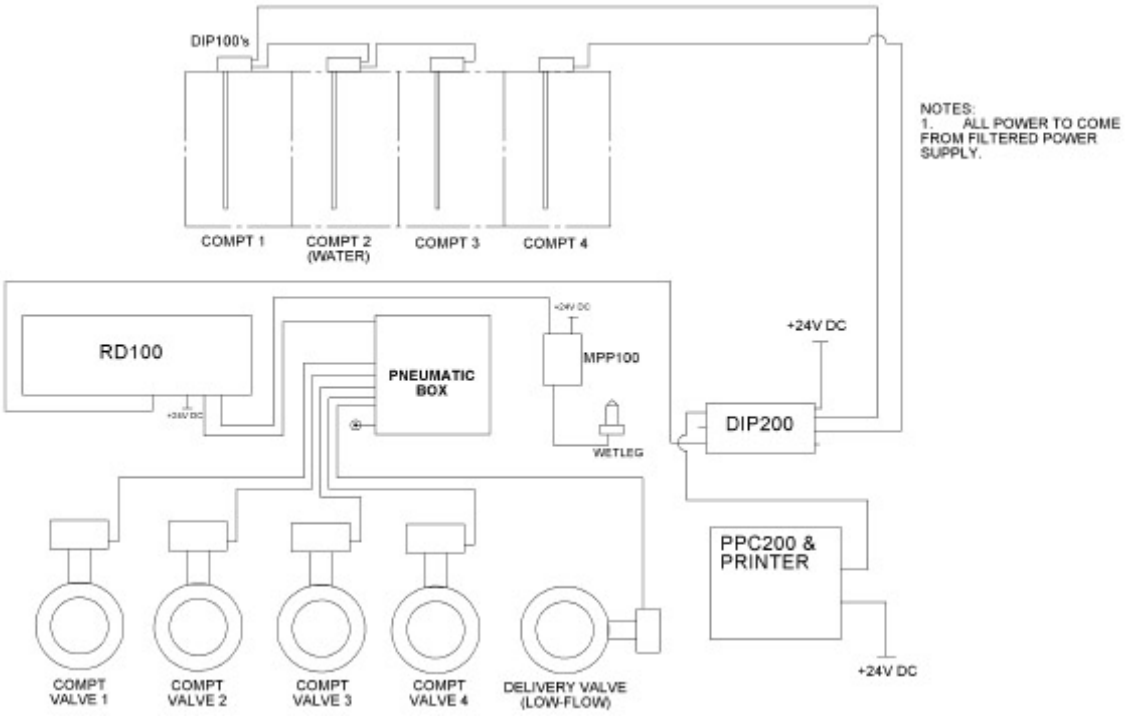
FIGURE 5/1/5 – 6

Liquip Internal Float Valve

FIGURE 5/1/5 – 7

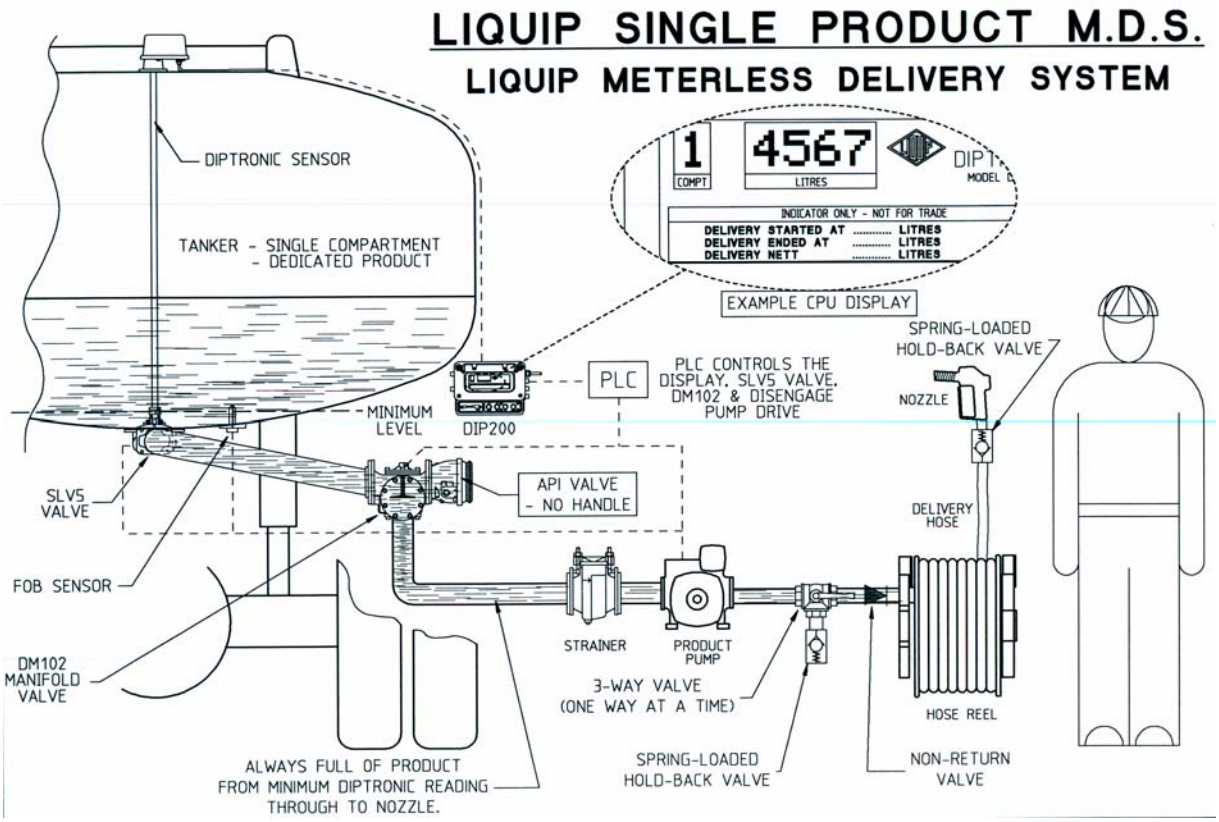
Typical Liquip MPP100 Series Monitor

FIGURE 5/1/5 – 8



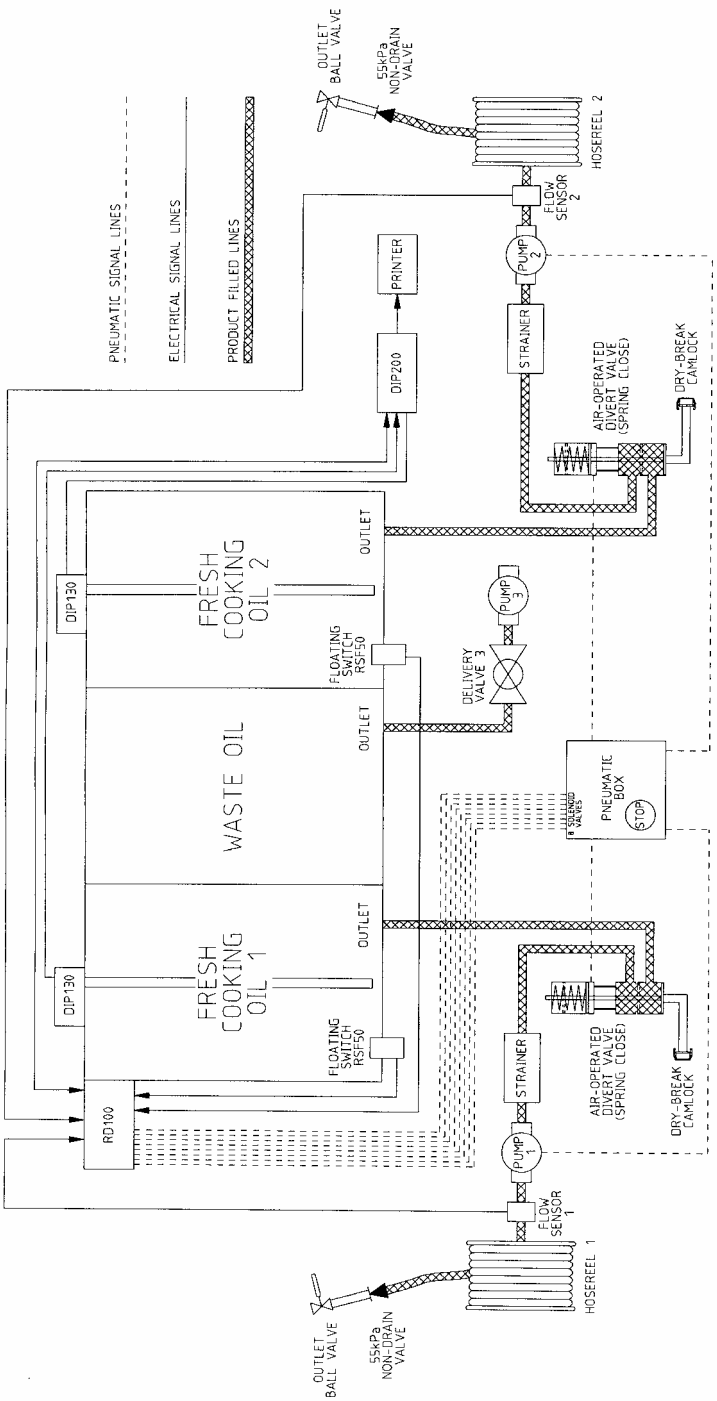
Typical System for Fertiliser – Variant 3

FIGURE 5/1/5 – 9



Typical System With Three-way Valve – Variant 4

FIGURE 5/1/5 – 10



Typical System for Cooking Oils – Variant 5