



Australian Government  
Department of Industry,  
Innovation and Science

## National Measurement Institute

### Certificate of Approval NMI 9/2/5

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 instruments herein described.

FMC Model Sening MultiLevel Vehicle Tank Measuring System

submitted by John Bean Technologies  
61D Marple Avenue  
Villawood NSW 2163

**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 80-1 Road Tankers with Level Gauging, Part 1 Metrological and Technical Requirements and Part 2 Metrological and Technical requirements, dated November 2014.

This approval becomes subject to review on 1/07/21, and then every 5 years thereafter.

#### DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern provisionally approved – interim certificate issued	13/06/14
1	Pattern amended (validity) – interim certificate issued	30/01/15
2	Pattern amended (validity, etc.) – interim certificate issued	29/07/15
3	Pattern approved – interim certificate issued	19/11/15
4	Pattern amended (Liquid level sensor and Software versions) – Variant 1 approved – certificate issued	1/05/17

## CONDITIONS OF APPROVAL

### **General**

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 9/2/5' and only by persons authorised by the submittor.

Instruments purporting to comply with this approval and currently marked 'NMI P9/2/5' may be re-marked 'NMI 9/2/5' but only by persons authorised by the submittor.

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.

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

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

**Dr A Rawlinson**

TECHNICAL SCHEDULE No 9/2/5

**1. Description of Pattern** **provisionally approved on 13/06/14**  
**approved 19/11/15**

An FMC model Sening MultiLevel road and rail tanker with level gauging system (Figure 1) approved for measuring the quantity of the liquid hydrocarbon products other than LPG in the tank/compartments.

**1.1 Field of Operation**

The field of operation of the measuring system is determined by the following characteristics:

- Minimum measured quantity,  $V_{min}$  200 L (#1)
- Capacity of road tanker 0.5 m<sup>3</sup> to 50 m<sup>3</sup>
- Capacity of rail tanker 10 m<sup>3</sup> to 120 m<sup>3</sup>
- Inclination  $\pm 5^\circ$
- Dynamic viscosity,  $\eta$  (at 20°C) 0.4 to 20 mPa.s (#2)
- Liquid temperature range  $-10^\circ\text{C}$  to  $50^\circ\text{C}$
- Ambient temperature range  $-25^\circ\text{C}$  to  $55^\circ\text{C}$
- Voltage of road vehicle battery 15 or 30 VDC (nominal)
- Accuracy class for system Class 0.5
- Applications Road and rail tankers

(#1)  $V_{min}$  - This value depends on the actual test results of each instrument; accuracy to be within 0.3% of batch volume.

(#2) The system is adjusted to be correct for the liquid for which it is to be verified as marked on the data plate

**1.2 Pumping Application**

If it is intended to connect the tank to separate pumping or measuring devices, it should be provided with the appropriate detachable coupling devices which shall be as short as possible.

Pumping installations shall comprise, in addition to the pump itself, no more than one filter and very short pipes. The installation shall be constructed so that it can be drained completely, each time the tank is emptied, without the need for any special measures.

For tanks equipped with a built-in manifold for measuring partial volumes delivered, the fitting of a diverting valve on each discharge pipe is permitted provided that any leakage of liquid through the diverting valve can be detected, e.g. the built-in manifold ensures complete and rapid discharge of the liquid that it contains. A sight glass or monitoring device at its bottom end shall allow the checking of its emptiness; and the installation and the control of the diverting valves is such that the product cannot flow back from one compartment to another.

For truck and trailer combinations; where the product is transferred from trailer to the pumping unit; the transfer pipes must be constructed so that the entire product is drawn through to the pumping unit leaving minimal residue and compliant with section 1.1.

### 1.3 The System

This automatic tank gauging system measures the level in a horizontal tank (measuring vessel), with compensation for the angle of inclination, in x and y direction in respect of horizontal.

The system is intended for volume measurement on a tanker. During normal operation, the volume is displayed on the calculator/indicator; this volume is *derived from the measured level in the compartment and pipework; all product after the external valve (API coupling) is deemed to be the delivered quantity – this can be achieved gravity or pumped discharge.*

Apart from the product volume at delivery temperature, on the basis of standard conversion methods the product volume at reference product temperature may also be viewed displayed.

### 1.5 Components of the Measuring System

- The system includes the following components:
  - A tank which may have a number of compartments, and which is designed to comply with NMI General Certificate 9/0/B for Vehicle Tanks of Capacities 0.5 to 105 kilolitres.
  - The MultiLevel is powered by the tank truck battery (16 to 32 V DC, 24 V nominal) as the power supply.
  - A Sening MLDSBO-XXXX series electronic dipstick and a model MLIF dipstick interface. (XXXX defines the length of the dipstick.) (Figure 2)
  - A Sening model MLDTS-2 temperature sensor. (Optional) (Figure 3)
  - A Sening model MLIS inclination sensor. (Figure 4)
  - A Sening model Liquid level (wet leg) sensor type NS-2E / NS-2F (Figure 5)
  - An optional Epson model TM-U220 or to any other equivalent (\*) printer.
- (\*) 'Equivalent' is defined to mean other proprietary equipment of the same or better specifications requiring no changes to the software specified in this approval for satisfactory operation of the complete system.

### 1.3 Calculator/indicator

A Sening model MultiLevel MLMAINDISP(X) calculator/indicator unit with a graphic-capable liquid crystal type display. For the purpose of meter verification the calculator/indicator has provision for displaying the delivery of liquid in litres. (Figure 6)

## 1.4 Software Versions

The metrologically relevant software modules are as follows:

Component/type	Software Version	CRC Checksum	
		EPROM	Flash-Memory
MLMAINDISP(X)	1.25 [---] (#)	0299ECFB	77028A8A
	1.26 [---] (#)	3804781E	3DD82AA6
MLIF	1.11	n/a	
NM2WET	1.13	n/a	

(#) [---] is the non-metrological relevant portion of the software

## 1.5 Verification Provision

Provision is made for the application of a verification mark.

## 1.6 Sealing Provision

Provision is made for the instrument to be sealed by an electrical dip switch located inside the main screen, once programming mode has been “turned off” the system needs to be electronically sealed by following the procedure shown in Figure 7. Once completed the screen is to be sealed with sealing wire across two securing bolts by an accredited NMI verification officer.

## 2. Description of Variant 1

**approved on 1/05/17**

The pattern using the Sening MultiTask P8000007497 calculator / indicator unit with a graphic-capable pressure sensitive touch screen type display. For the purpose of meter verification the calculator/indicator has provision for displaying the delivery of liquid in litres. (Figure 8)

### 2.1 Sealing Provision

Provision is made for the instrument to be sealed by an electrical dip switch located inside the main screen and the system must be electronically sealed following the procedure shown in Figure 9. An event counter records every time the electronic seal is opened. By noting the value of the event counter at the time of verification it is possible to verify if the seal has been opened since the previous verification.

## TEST PROCEDURE No 9/2/5

The measuring system can be verified using the procedures given in the NMI documents NITP 9 *National Instrument Test Procedures for Vehicle Tanks* and General Certificate 9/0/B *Vehicle Tanks of Capacities 0.5 to 105 kilolitres*.

The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

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.

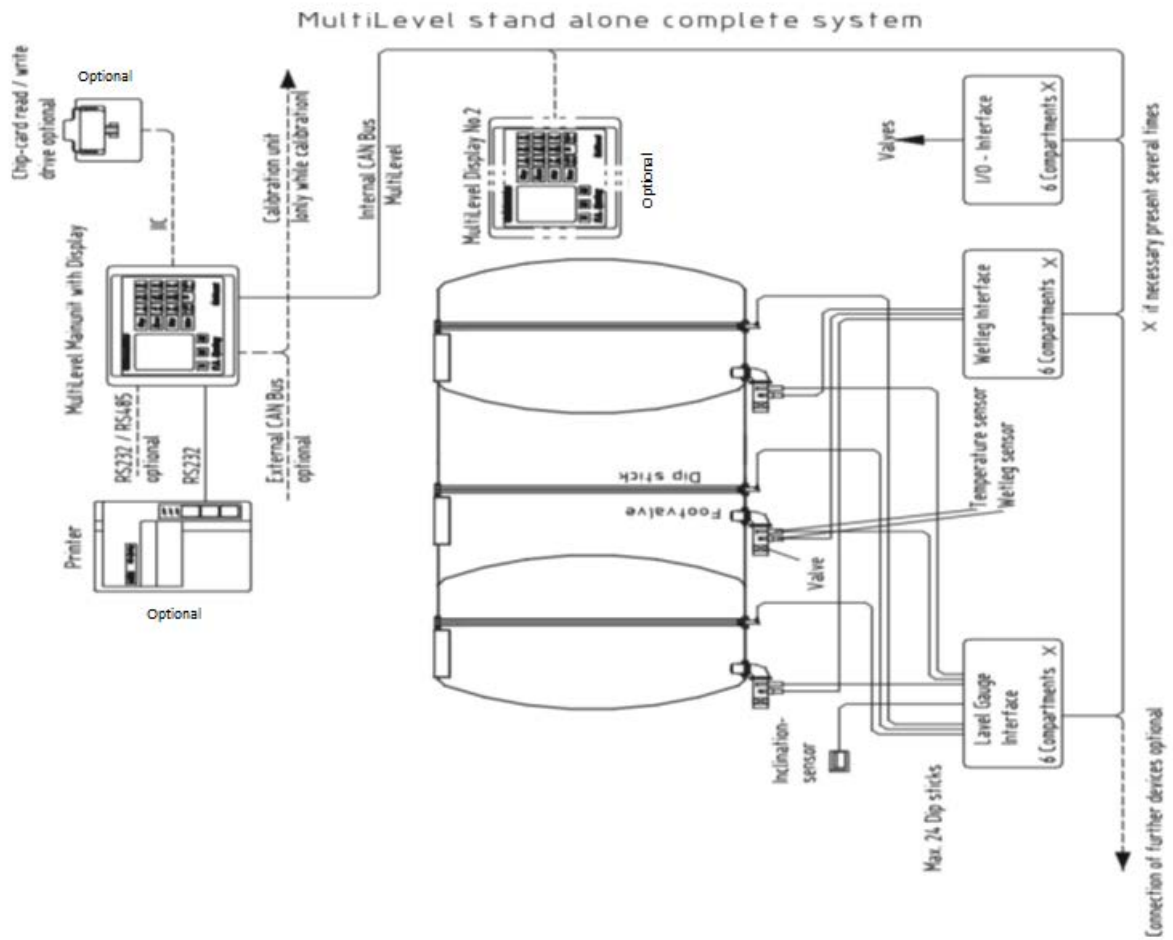
The verification may be carried out by either delivering a traceable volume into the tank compartment, or alternatively by dispensing the liquid from the tank compartment via traceable volume measuring equipment.

Within the field of operation, the reference equipment must be able to measure the volume at any level in the-tank compartment 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 2 × minimum measured quantity, the interpolated volume between two adjacent calibration points is within 0.3%.

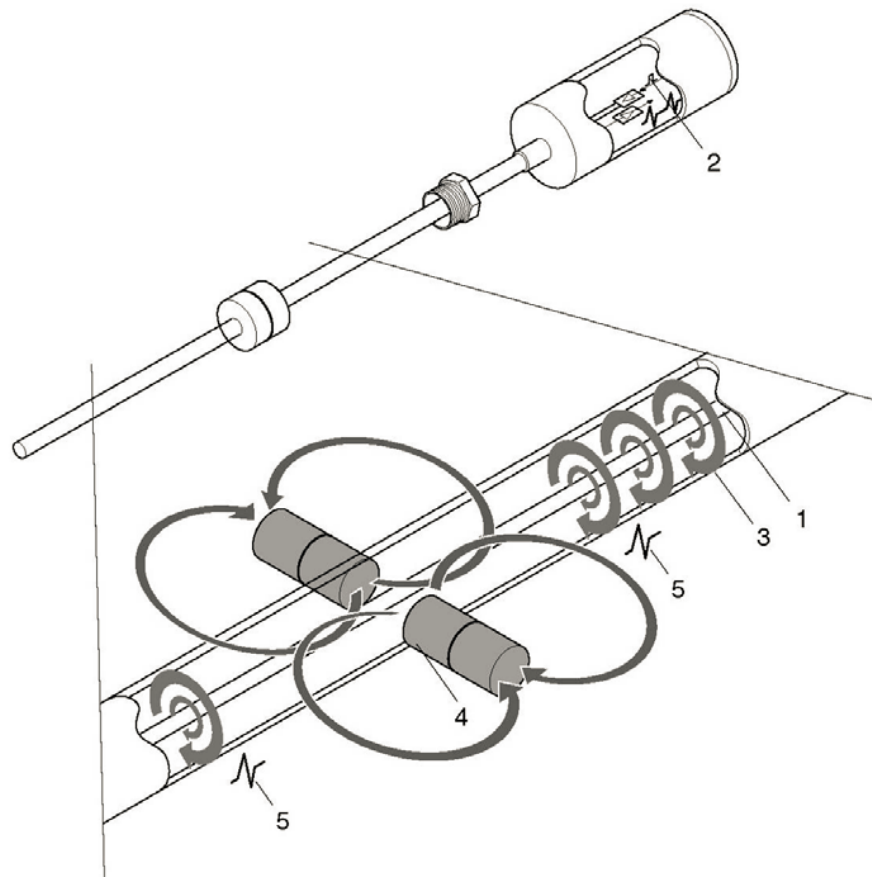
For each tank, the calibration points shall include the minimum liquid level (rounded up to the nearest 10 L) and the maximum liquid level (rounded down to the nearest 10 L). These maximum and minimum volumes for each tank/compartment shall be indicated to the user as the operating range of the instrument.

FIGURE 9/2/5 – 1

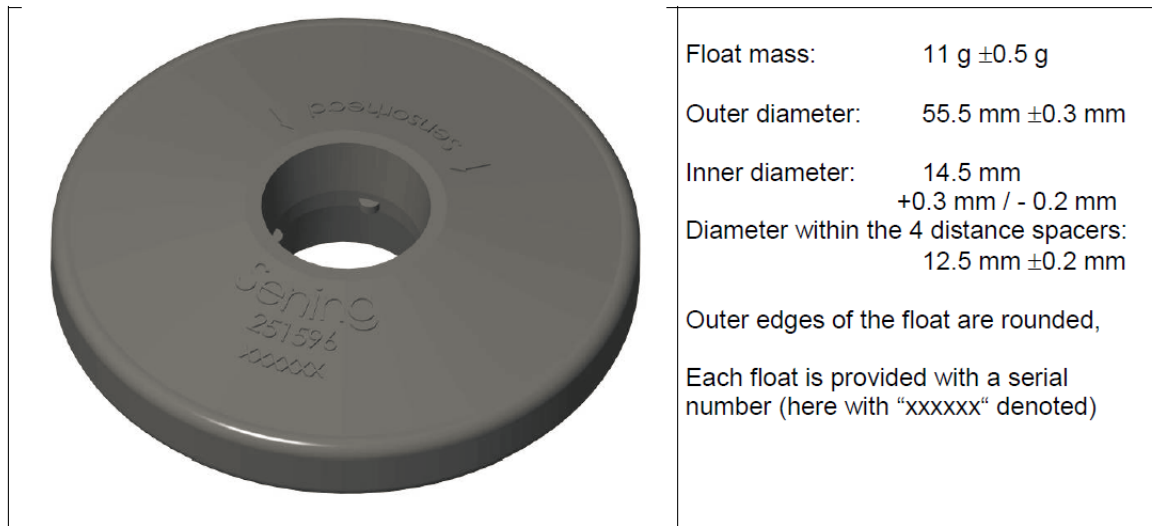


FMC model Sening MultiLevel road and rail tanker with level gauging system

FIGURE 9/2/5 – 2



Float that belongs to the electronic dip stick



Sening MLDSBO-XXXX series electronic dipstick



FIGURE 9/2/5 – 3



Sening model MLDTs-2 temperature sensor

FIGURE 9/2/5 – 4



Sening model MLIS inclination sensor.

FIGURE 9/2/5 – 5



Sening model Liquid level (wet-leg) sensor type NS-2E / NS-2F

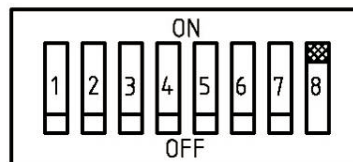
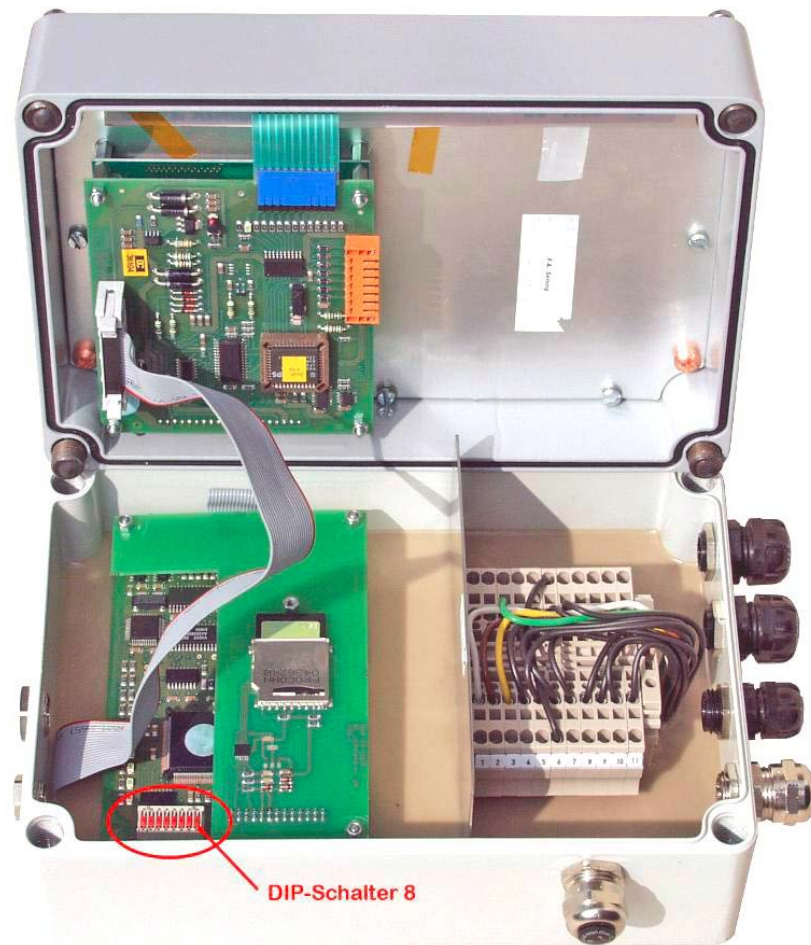
FIGURE 9/2/5 – 6



Sening model MultiLevel MLMAINDISP(X) calculator/indicator

FIGURE 9/2/5 – 7

**Breaking the seal – MultiLevel calculator/indicator (Pattern)**



Dip switch 8 in the MultiLevel Main Unit "MLMAINDISP" is to be switched to "ON" to break the electronic seal. For the software, no additional actions are required.

- Open the MultiLevel Main Unit
- Set dip switch 8 in MultiLevel to "ON" to break the seal.
- Note the message on the main display home screen to read "Seal Broken"

FIGURE 9/2/5 – 7 (continued)

**Restoring the seal – MultiLevel calculator/indicator (Pattern)**

- Open the MultiLevel Main Unit
- Set dip switch 8 in MultiLevel to “OFF” to restore the seal.

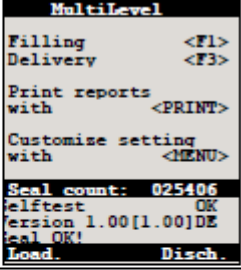
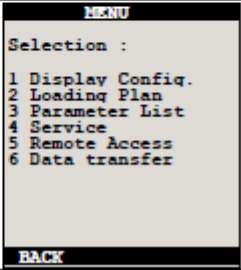
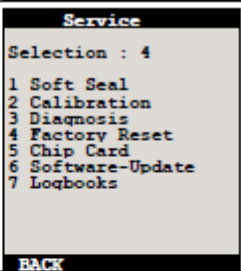
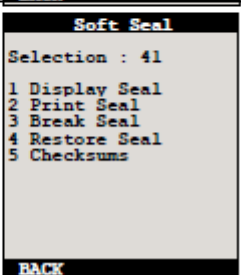
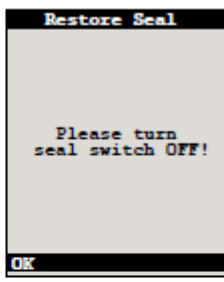
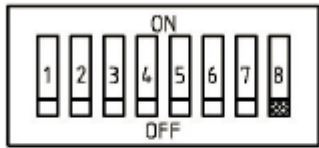
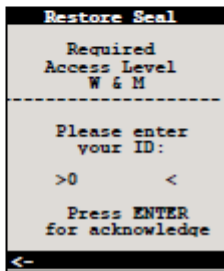
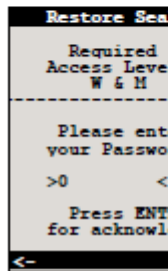
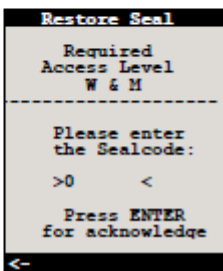
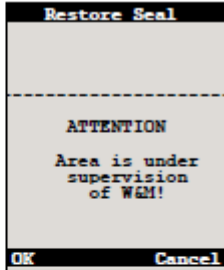
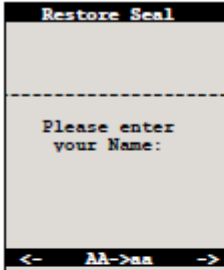
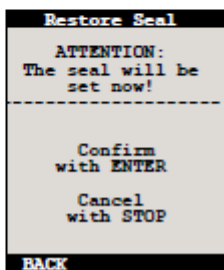
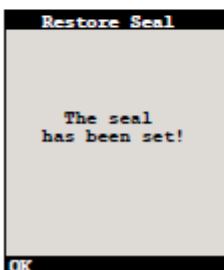
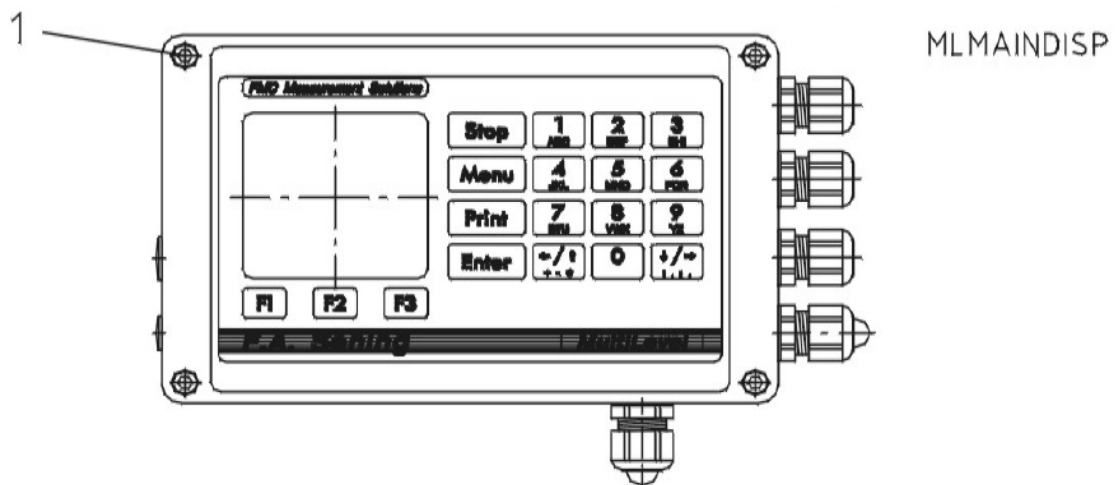
Main screen	key <Menu>	 <pre> MultiLevel Filling      &lt;F1&gt; Delivery    &lt;F3&gt; Print reports with       &lt;PRINT&gt; Customize setting with      &lt;MENU&gt; Seal count: 025406 Selftest   OK Version 1.00 [1.00] DE Load OK! Load       Disch.           </pre>
Menu	key <4> "Service"	 <pre> MENU Selection : 1 Display Config. 2 Loading Plan 3 Parameter List 4 Service 5 Remote Access 6 Data transfer BACK           </pre>
Service	key <1> "Seal"	 <pre> Service Selection : 4 1 Soft Seal 2 Calibration 3 Diagnosis 4 Factory Reset 5 Chip Card 6 Software-Update 7 Logbooks BACK           </pre>
Seal	key <4> "Set seal"	 <pre> Soft Seal Selection : 41 1 Display Seal 2 Print Seal 3 Break Seal 4 Restore Seal 5 Checksums BACK           </pre>

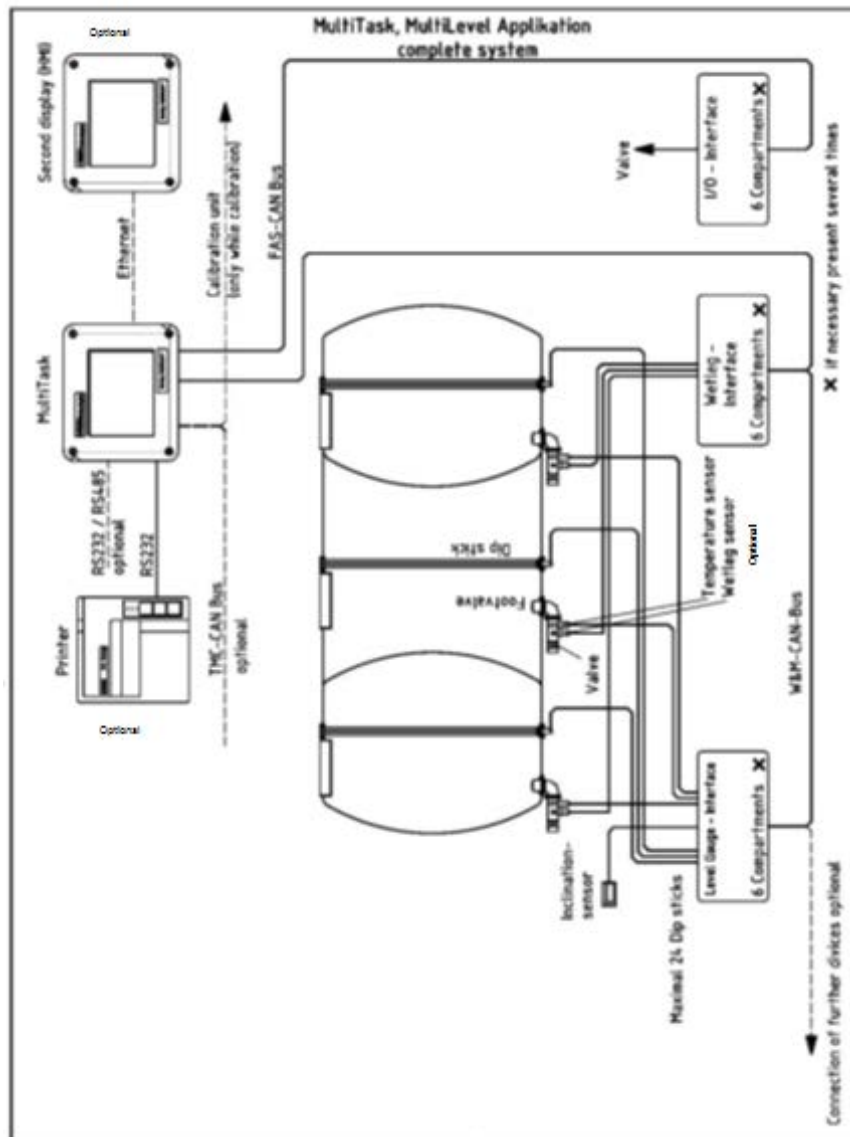
FIGURE 9/2/5 – 7 (continued)

<p>Set seal switch in MLMAINDISP to OFF if this has not been already done!</p>			
<p>ID; enter password and seal number (are deposited as parameters in the system)</p>			
<p>Message and input of names</p>			
<p>ENTER, to confirm that the seal shall be set</p>			



Complete the sealing process by closing up the main display taking care that the 4 cap screws on the front of the display are secured, and seal the two left hand cap screws by threading the sealing wire through the holes provided.

FIGURE 9/2/5 – 8



(a) FMC model Sening MultiTask road and rail tanker with level gauging system – Variant 1



(b) Sening model MultiTask calculator/indicator – Variant 1

FIGURE 9/2/5 – 9

**Breaking the seal – MultiTask calculator/indicator (Variant 1)**


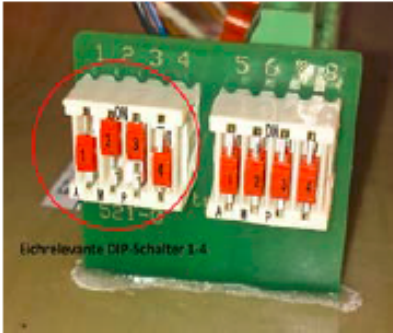
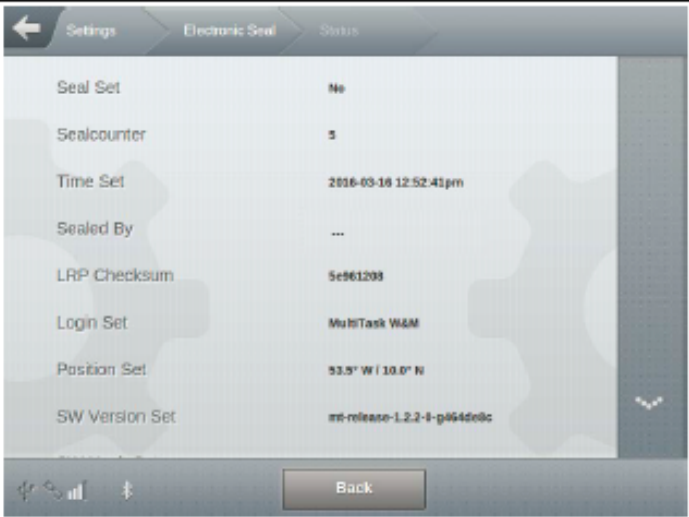
<p>Open the MultiTask man unit. The metrologically related DIP switches are located in the display part.</p>																												
<p>Set the DIP switch 4 of the display unit in position OFF to break the electronic W&amp;M seal.</p>	 <p>Eichrelevante DIP-Schalter 1-4</p>																											
<p>Check the status of the electronic W&amp;M seal on the display.</p> <p>Setup: "/Settings/Electronic Seal/Status"</p> <p>„Seal Set“ = „No“</p> <p>In order to set the electronic seal via the display of the MultiTask, it must have been set once at "OFF".</p>	 <table border="1"> <thead> <tr> <th>Settings</th> <th>Electronic Seal</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Seal Set</td> <td></td> <td>No</td> </tr> <tr> <td>Sealcounter</td> <td></td> <td>5</td> </tr> <tr> <td>Time Set</td> <td></td> <td>2016-03-16 12:52:41pm</td> </tr> <tr> <td>Sealed By</td> <td></td> <td>---</td> </tr> <tr> <td>LRP Checksum</td> <td></td> <td>5e961208</td> </tr> <tr> <td>Login Set</td> <td></td> <td>MultiTask W&amp;M</td> </tr> <tr> <td>Position Set</td> <td></td> <td>93.9° W   10.0° N</td> </tr> <tr> <td>SW Version Set</td> <td></td> <td>mt-release-1.2.2-4-g964de9c</td> </tr> </tbody> </table>	Settings	Electronic Seal	Status	Seal Set		No	Sealcounter		5	Time Set		2016-03-16 12:52:41pm	Sealed By		---	LRP Checksum		5e961208	Login Set		MultiTask W&M	Position Set		93.9° W   10.0° N	SW Version Set		mt-release-1.2.2-4-g964de9c
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SW Version Set		mt-release-1.2.2-4-g964de9c																										

FIGURE 9/2/5 – 9 (continued)

**Restoring the seal – MultiTask calculator/indicator (Variant 1)**

<p>Set the DIP switch 4 of the display unit to ON to enable the set of the electronic W&amp;M seal.</p>	 <p>Eichrelevante DIP-Schalter 1-4</p>
<p>Select menu „Electronic Seal/Set“</p> <p>Setup: “/Settings/Electronic Seal/Set”</p>	
<p>Enter the name at „Sealed by“</p>	



FIGURE 9/2/5 – 9 (continued)

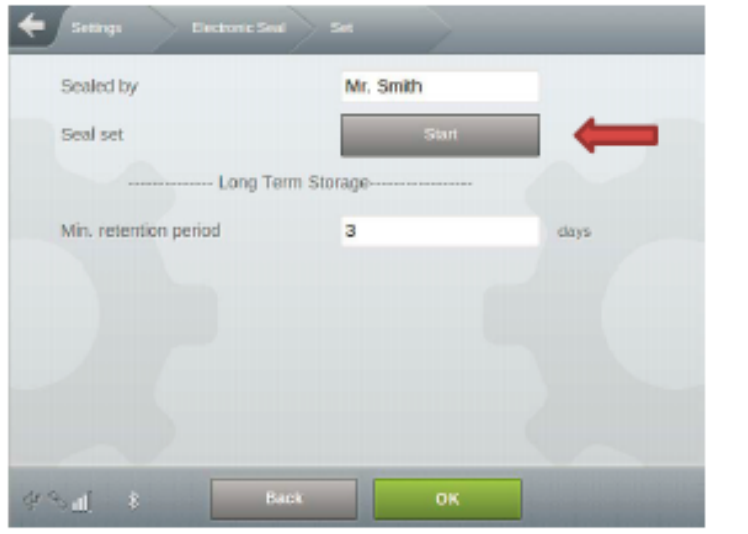

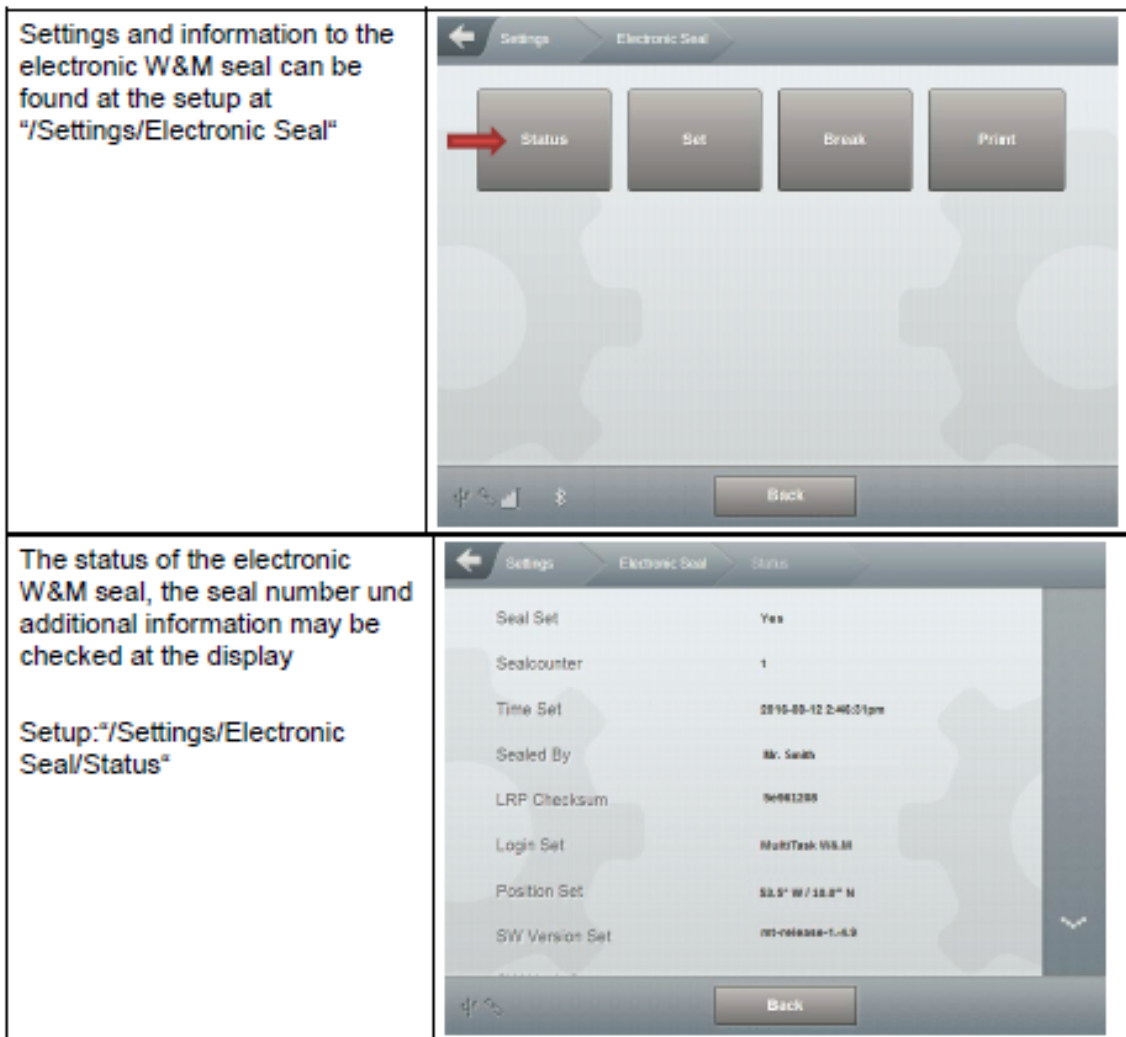
<p>Set the electronic seal by pressing the „Start“ button</p>	
<p>Check the status of the electronic W&amp;M seal. The electronic seal is now set.</p> <p>Setup: "/&gt;Settings/Electronic Seal/Status"</p> <p>„Seal Set“ = „Yes“</p>	

FIGURE 9/2/5 – 9 (continued)

**Display / Print of the seal number – MultiTask calculator/indicator (Variant 1)**



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