



Australian Government  
Department of Industry,  
Innovation and Science

## National Measurement Institute

36 Bradfield Road, West Lindfield NSW 2070

### Certificate of Approval

### NMI 5/6E/20

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.

Fonterra Model SMART-2015-1 Milk Flowmetering System

submitted by Fronterra Cooperative Limited  
109 Fanshawe Street  
Auckland City 1010  
NEW ZEALAND

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

This approval has been granted with reference to document NMI R 117, Measuring Systems for Liquids Other than Water, dated July 2011.

This approval becomes subject to review on 1/05/20, and then every 5 years thereafter.

#### DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern approved – interim certificate issued	23/04/15
1	Pattern approved – certificate issued	11/09/15
2	Pattern amended (submitted by) – notification of change issued	6/04/18

## CONDITIONS OF APPROVAL

### General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 5/6E/20' and 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.

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

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



**Mr Darryl Hines**

Manager - Pattern Approval,  
Policy and Licensing Section

TECHNICAL SCHEDULE No 5/6E/20

**1. Description of Pattern** **approved on 23/04/15**

The Fonterra model SMART-2015-1 vehicle-mounted milk flowmetering system using a PROCES-DATA model PD340-C76 (\*) electromagnetic flowmeter approved for measuring the milk collected from a milk tank.

**1.1 Field of Operation**

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

- Minimum measured quantity ( $V_{min}$ ) 400 L
- Maximum flow rate ( $Q_{max}$ ) 2000 L/min
- Minimum flow rate ( $Q_{min}$ ) 600 L/min
- Maximum pressure of the liquid ( $P_{max}$ ) 800 kPa
- Ambient temperature range  $-10^{\circ}\text{C}$  to  $55^{\circ}\text{C}$
- Accuracy class 0.5
- Vehicle-mounted operation
- Product – milk at nominal controlled temperature

The flow meter is adjusted to be correct for the liquid (milk) for which it is to be verified as marked on the data plate.

**1.2 The System** (Figure 1)

(i) A supply tank.

The supply tank is a milk tank or a vat to which the metering system is temporarily connected. The base of these tanks slopes towards the outlet to facilitate emptying of the contents during the measuring process.

(ii) Pump

A centrifugal type pump or a positive displacement pump of sufficient capacity may be used to draw the milk from the supply tank outlet, which may be located lower than the inlet of the pump; however for the centrifugal type pump the level of milk in the supply tank is higher than the pump inlet.

A check valve at the inlet of the pump may be required to prevent draining of liquid.

Flexible piping may be used with an appropriate adaptor/reducer to connect the pump to the outlet of the supply tank.

(iii) Air Elimination Device

A Bartec 6900 series bubble or other equivalent (#) air sensor is used to determine when the pipe is full before commencing pumping, control the pump speed and determine the end of collection and ramping the speed down to allow a controlled laminar flow of the milk at the rate it is running from the tank.

The spring-loaded non-return valve located directly after the pump and before the flowmeter is used to maintain a constant head pressure for the pump.

(#) ‘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 system.

(iv) Measurement Transducer

The measurement transducer is a PROCES-DATA model PD340-C76 (\*) electromagnetic calculating flowmeter (Figure 2) installed in a horizontal or vertical position downstream of the air sensing device.

(\*) May also be known as a DME model PD340-C76 flowmeter.

(v) Valves

To prevent reverse flow, a spring-loaded non-return valve placed directly after the pump opens at pressures above 20 kPa. There are two milk line valves that divert milk to either the truck vessel (tanker) or the trailer vessel. There are purge valves that allow air to be eliminated during the initial start-up sequence; both the tanker and the trailer have a vent valve positioned on the top of the vessel to allow pressure equalisation during filling, emptying and clean-in-place (CIP).

(vi) Flow Control

A flow control valve/device may be fitted downstream of the flowmeter.

(vii) Transfer Point

The transfer point is defined by the electrodes of the electromagnetic flowmeter.

(viii) Indicator

A Fonterra model SMART indicator (Figure 3) compatible for use with the electromagnetic calculating flowmeter and configured for displaying the volume in 1 L increments. The indicator uses version 1.x software.

The measured volume is calculated by the PROCES-DATA model PD340-C76 calculating flowmeter and is transmitted digitally to the SMART indicator using the P-NET communications protocol. The indicator displays the volume value to the operator, prints two dockets of the collected volume to a docket printer and logs the data to a database on the indicator as well as transferring the data to an In Cab System which in turn transmits the collection volume and farm details to the Fonterra database.

The model SMART indicator (software version 1.x) has the following features:

- A 10.1 inch LCD touch screen and surround membrane keypad.
- A docket printer.
- Operator functions for all milk collection functionality such as alert warning screens, start, stop and abort soft buttons etc.
- Quad sampler using peristaltic pumps using stepper motors
- Serial communications to connect four sample vial RFID read/writers, tank and trailer RFID reader
- Digital and analogue inputs to detect valve position status, milk temperature, cool box temperature, air level.
- Digital outputs to control valves.
- Lynch spool valve controller.
- Incorporates programmable levels of security. Access to meter calibration is only possible using nominated user code and password, during normal operation calibration functionality is disabled.

(ix) Power Supply

The power supply is provided by the vehicle to ensure the system operates on a voltage between 15 and 30 volts DC.

### 1.3 Operation

There are two modes of operation. The first is to have all collection information automatically downloaded via the ICS (In Cab System) directly for Fonterra. The second is to have the operator manually enter the collection details via the MSS screens. All collection information is validated against known records in the database and cross referenced using the Vat RFID. When any operator/driver overrides are activated these actions are logged to the SMART database for verification.

A typical sequence of operation is:

- All collection details are entered into the SMART indicator and validated against the internal database (note: no pumping can occur until all the fields are entered correctly). These include driver number, farm number, shift number, estimated collect volume, etc;
- Measure the quantity collected;
- Repeat above for each load;
- Discharge the milk collected and initiate data transfer sequence; and
- Initiate CIP (clean-in-place) operation.

### 1.4 Verification Provision

Provision is made for the application of a verification mark.

### 1.5 Sealing Provision

Access to the calibration functionality is electronically protected. During normal operation all calibration functionality is automatically disabled. Calibration can only be performed on a certified calibration vessel at designated Fonterra sites.

The model SMART indicator can display all the details pertaining to the calibration audit trail. Access to the calibration audit trail for viewing purposes can be viewed by any valid user but no changes can be made. All calibration audit information is stored on the indicator and well as in the Fonterra database.

### 1.6 Descriptive Markings

Instruments are marked with the following data, together in one location, in the form shown at right:

Manufacturer's mark, or name written in full	Fonterra
Pattern approval number for the instrument	NMI 5/6E/20
Model number	SMART-2015-1
Serial number of the instrument	.....
Maximum flow rate, $Q_{max}$	2000 L/min
Minimum flow rate, $Q_{min}$	600 L/min
Minimum measured quantity ( $V_{min}$ )	400 L
Priming quantity	..... L
Approved for use with milk	

## TEST PROCEDURE No 5/6E/20

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

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

Instruments are to be tested with milk and the system either primed with milk before commencing the delivery, or the priming quantity marked on the data plate is added to the quantity measured.

NOTE: The quantity required to prime the system shall be determined at verification and shall be stamped on the nameplate. Complete one or more deliveries and check the volume indicated against the actual volume.

### **Maximum Permissible Errors**

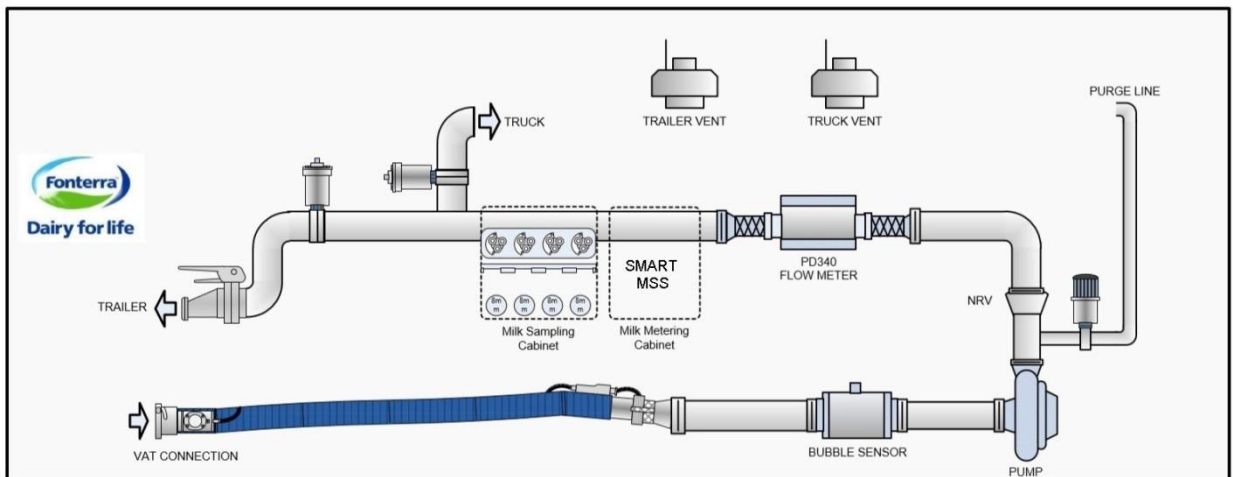
The maximum permissible errors are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

### **Empty Compartment Test**

- (a) Allow the supply to run dry during a test delivery; stop the pump motor and refill or change either the supply tank or the proving measure. Then start the pump motor to allow the delivery into the proving measure to continue; or
- (b) Allow the proving measure to run dry during a test delivery.

NOTE: This test should only be carried out where it could be expected that the tank will be completely emptied during a normal day's operation. The maximum allowable difference between metering with no air/gas and introducing air/gas is 1%.

FIGURE 5/6E/20 – 1



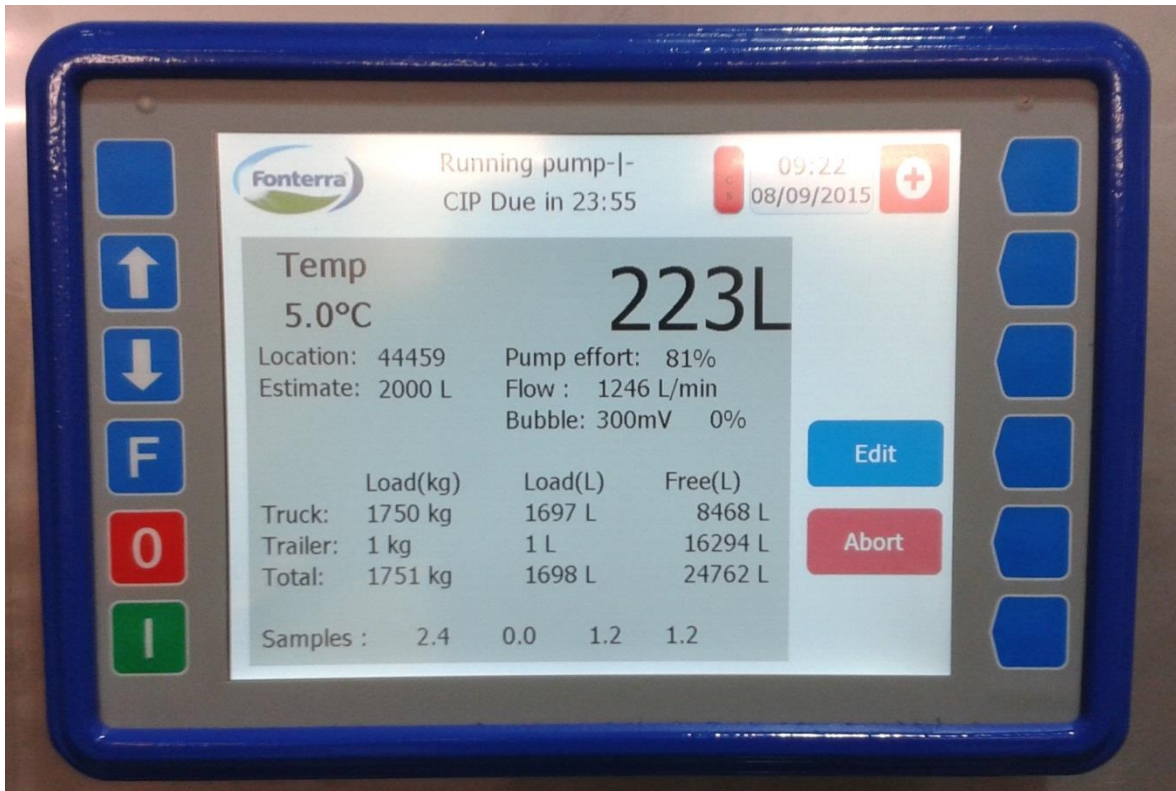
Fonterra Model SMART-2015-1 Milk Flowmetering System

FIGURE 5/6E/20 – 2



PROCES-DATA Model PD340-C76 Electromagnetic Flowmeter

FIGURE 5/6E/20 – 3



Fonterra Model SMART Indicator

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