Australian Government
National Measurement Institute
Bradfield Road, West Lindfield NSW 2070

Certificate of Approval

NMI 5/6B/215

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.

SATAM Model ZC17.24 Liquid-measuring System

submitted by Australian Fluid Handling
Factory 1, 25-27 Burns Road
Altona Victoria 3018

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 June 2011.

This approval becomes subject to review on **1/01/20**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 approved – interim certificate issued	9/12/09
1	Pattern & variant 1 approved – interim certificate issued	15/01/10
2	Pattern & variant 1 amended (additional model meters), reviewed & updated – certificate issued	8/07/15

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number ‘NMI 5/6B/215’ and only by persons authorised by the submittor.

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

Dr A Rawlinson

TECHNICAL SCHEDULE No 5/6B/215

1. Description of Pattern approved on 9/12/09

A bulk flowmetering system incorporating a SATAM model ZC17.24 rotary motion positive displacement flowmeter (Table 1 & Figures 1 and 2) for bulk metering of petroleum products other than LPG.

1.1 Field of Operation

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

• Minimum measured quantity, V_{min}	100 L	(#1)
• Maximum flow rate, Q_{max}	400 L/min	
• Minimum flow rate, Q_{min}	40 L/min	
• Maximum pressure of the liquid, P_{max}	800 kPa	
• Minimum pressure of the liquid, P_{min}	100 kPa	(#2)
• Dynamic viscosity (at 20°C)	0.4 to 20 mPa.s	(#3)
• Liquid temperature range	-10°C to 50°C	
• Ambient temperature range	-25°C to 55°C	
• Accuracy class	0.5	

(#1) The calculator/indicator indicates the volume at least in 1 L increments.

(#2) As specified for the gas elimination device for effective operation.

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

1.2 Components of the Flowmetering System

(i) Tank

A supply tank, which may incorporate a detector for low liquid-level. The detector is used to prevent further deliveries when the low liquid-level is reached, and prevents air from entering the pipework.

(ii) Pump

A positive displacement, centrifugal or submersible turbine type pump may be used to provide flow through one or more flowmeters.

Systems fitted with a positive displacement pump shall include a gas elimination device capable of continuously separating any air/vapours entrained in the liquid upstream of the flowmeter.

A centrifugal type pump may only be installed below the liquid level of the supply tank and a submersible turbine type pump may be used either alone or supplying a centrifugal type pump positioned above or below the liquid level of the supply tank. These systems shall include a gas elimination device capable of removing any pockets of air/vapours that may form in the pipework upstream of the flowmeter.
In any case, for all combination of usage, the pump(s) shall be of sufficient capacity to ensure that each flowmeter can operate over its approved flow rate range.

(iii) Non-return Valve

A non-return valve is fitted upstream of the flowmeter to prevent reverse flow and keep the pipework full of liquid at all times.

(iv) Gas Elimination Device (Figure 2)

The gas elimination device, comprising a SATAM model EC42/FS24 strainer air eliminator (Figure 2) (or any other equivalent approved gas elimination device), fitted upstream of the flowmeter to prevent vapours entering the flowmeter.

For applications where the duration of the shutdown period does not cause thermal contraction of the liquid and formation of pockets of gas upstream of the flowmeter, the gas elimination device may be modified for use as a strainer only, provided the supply tank incorporates a detector for low liquid-level.

(v) Measurement Transducer

The measurement transducer is a SATAM model ZC17.24 rotary motion positive displacement flowmeter (Figure 3) with a mechanical output shaft connected via 90° bevel gear to a micrometer-type calibration adjustment mechanism with a slotted shaft into which the drive shaft of the calculator/indicator fits. Note: The gear arrangement and calibration mechanism may be removed when fitting an approved pulse output device interfaced to an electronic calculator/indicator.

Provision is made in the pipework for measuring the liquid temperature and pressure at the flowmeter during verification/certification of the system.

The calibration adjustment is carried out using the liquid which the flowmeter is intended to measure.

(vi) Calculator/Indicator

The calculator/indicator is an approved Veeder-Root mechanical register, as described in the documentation of approval NSC S184B or any other compatible (#) NMI-approved calculator/indicator. The drive shaft of the calculator/indicator is designed to fit the slotted shaft of the flowmeter calibration mechanism.

To facilitate the deliveries, a pre-set mechanism may be fitted between the mechanical calculator/indicator and the flowmeter provided the pre-set device is marked “Pre-set Amount Not for Trade Use” or similar wording. The pre-set device is mechanically linked to a SATAM model XAD39 flow control valve to automatically stop the delivery. Upon completion of a delivery, the volume delivered is displayed by the calculator/indicator, which may differ from the pre-set amount.

The Veeder-Root mechanical register and the pre-set device may be replaced with any other compatible approved calculator/indicator and pre-set device.

(#) ‘Compatible’ is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system

(vii) Transfer Device

The transfer device is located downstream of the flowmeter and clearly defines the start and stop of the measured quantity. The transfer device may be in the form of a breakaway coupling, a nozzle or a positive shut-off component, such as a manually or automatically operated flow control valve. Whatever the transfer device used, the pipework upstream of the transfer device shall be maintained full of liquid.

The system may have more than one transfer point, however the pipework design is such that once the measurement starts the flow continues through the intended transfer point until delivery is finalised; there is no possibility for diverting the measured quantity other than through the intended transfer point.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Sealing Provision

Refer to approval for the controller/indicator for sealing requirements.

1.5 Descriptive Markings

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

Pattern approval mark	NMI 5/6B/215	
Manufacturer's identification mark or trade mark	…..	
Meter model	…..	
Serial number of the instrument	…..	
Year of manufacture	…..	
Maximum flow rate, Q_{max}	….. L/min	
Minimum flow rate, Q_{min}	….. L/min	
Maximum pressure of the liquid, P_{max}	….. kPa	
Minimum pressure of the liquid, P_{min}	….. kPa	
Type of the liquid for which the system is verified	.....	(#)
Environmental class	class C	

(#) This may be located separately, e.g. on a metal tag sealed to the instrument.

The minimum measured quantity (V_{min}) is clearly visible on the indicating device, e.g. 'Minimum Delivery 100 L'.

2. Description of Variant 1 — approved on 9/12/09, amended draft/15

Using certain other SATAM flowmeters (and relevant model strainer air eliminators) as listed in Table 1. EC42/FS24 strainer air eliminator. The pattern, model ZC17.24, is shown in **bold**.

TABLE 1 – Approved Flowmeter Models and Specifications

Flowmeter Model	Minimum Flow Rate (*Qmin*) (L/min)	Maximum Flow Rate *(Qmax*) (L/min)	Minimum Delivery *(Vmin*) (L)	Air Eliminator Model
ZC17.12	20	200 (#1)	100	EC42/FS24 (#3)
ZC17.24	**40**	**400 (#2)**	**100**	**EC42/FS24** (#3)
ZC17.48	80	800 (#2)	100	EC42/FS24 (#3)
ZC17.80	133	1333	100	EC31 (#4)
ZC17.150	250	2500	200	EC32 (#4)
ZC17.250	416	4166	200	EC39
ZC17.330	550	5500	200	EC50

(#1) The calculator/indicator indicates the volume at least in 0.1 L increments

(#2) The calculator/indicator indicates the volume at least in 1 L increments

(#3) Refer Figure 2

(#4) Refer Figures 4a & 4b

TEST PROCEDURE

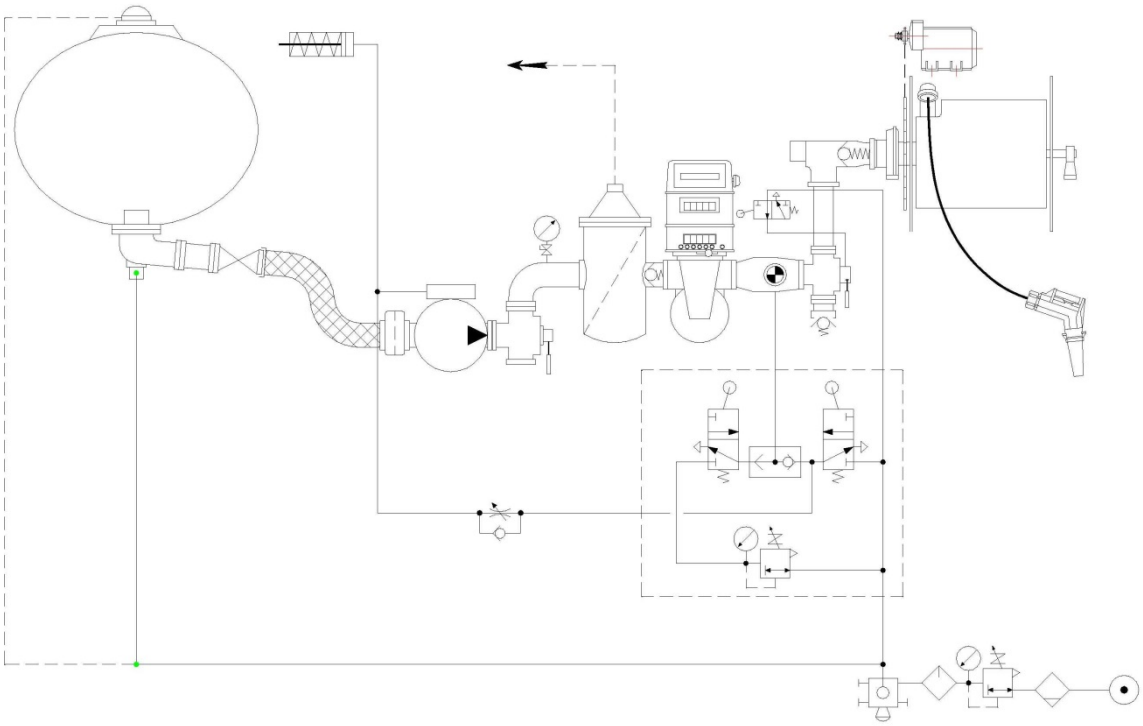
Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

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.

Maximum Permissible Errors

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

FIGURE 5/6B/215 – 1



SATAM Model ZC17.24 Flowmetering System
(Including Showing a Typical Delivery System With Hose Reel)

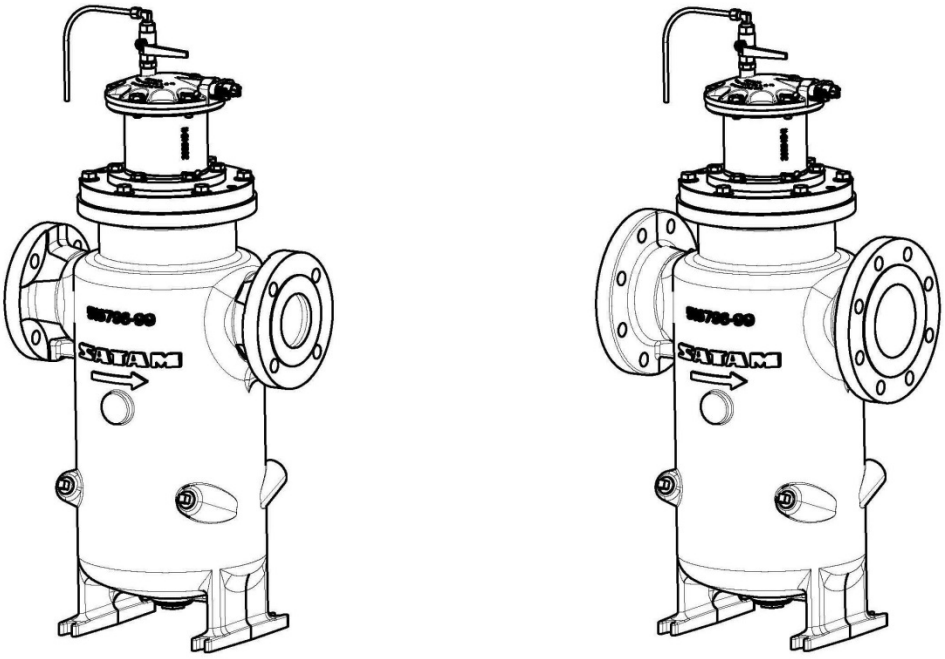
FIGURE 5/6B/215 – 2

SATAM Model EC42/FS24 Strainer Air Eliminator

FIGURE 5/6B/215 – 3

SATAM ZC17 Series Flowmeter With Veeder-Root Mechanical Register

FIGURE 5/6B/215 – 4



Model EC31 Model EC32

Other SATAM EC Series Strainer Air Eliminators

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