



Bradfield Road, West Lindfield NSW 2070

Supplementary Certificate of Approval

NMI S413

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.

Smith Meter Inc AccuLoad III Model ALIII-S Controller for Liquid-measuring Systems

submitted by Diamond Key International
 110 Henderson Road
 Rowville VIC 3178

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.

This approval becomes subject to review on **1/02/19**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern approved – interim certificate issued	14/01/03
1	Pattern & variant 1 approved – certificate issued	10/04/03
2	Pattern amended (add biodiesel) – notification of change issued	31/08/06
3	Pattern & variant 1 reviewed – variants 2 & 3 approved – certificate issued (incl. notification of change)	19/05/08
4	Pattern & variants 1 to 3 reviewed & updated – certificate issued	4/04/14

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI (or NSC) S413' and only by persons authorised by the submitter.

Instruments incorporating a component purporting to comply with this approval shall be marked 'NMI (or NSC) S413' in addition to the approval number of the instrument, and only by persons authorised by the submitter.

It is the submitter'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 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.

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

Dr A Rawlinson

TECHNICAL SCHEDULE No S413

1. Description of Pattern

approved on 14/01/03

A Smith Meter Inc AccuLoad III model ALIII-S (*) loading controller (Figure 1) for use in liquid-measuring systems incorporating compatible (#) NMI-approved flowmeters.

(*) Abbreviated model number - the full model number for the pattern is ALIII-S-XP-ALX2-A20000.

1.1 Field of Operation

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

- Environmental class -25°C to 55°C
- Power supply 240 V AC mains supply
- Maximum input frequency 10 000 pulses/second/channel
- Accuracy applications Class 0.5

For volume conversion for temperature facility:

- Liquid temperature range -10°C to 50°C
- The conversion is based on *ASTM-IP-API Petroleum Measurement Table 54A* for Crude Oils, or *Table 54B* for Generalised Petroleum Products, or *Table 54C* for pure biodiesel (to Australian government standard), or *Table 54D* for Lube Oils.

1.2 Controller

The ALIII-S controller (Figure 1) incorporates an alphanumeric liquid crystal display (LCD) with 240 by 64 pixel for displaying messages/prompts, and volume display for each flowmeter (loading arm/line).

The instrument can control the delivery of 2 separate loading arms/lines. The delivery operation is authorised by entering a personal identification number (PIN) for identifying the user. The data entry/selection is made via the eleven numeric and fourteen function keys. The volume display can be programmed for 0.1 L, 0.01 L or 1 L increments.

The software version is ALX# Revision 10-01 CRC CE8E6B14 (where # denotes the number of loading arms, i.e. # = 2 for the pattern), which can be viewed when all deliveries are completed by selecting Diagnostics Menu from the Main Menu and selecting Software Version item.

1.3 Pulse Generator

The ALIII-S controller is approved for use with a Smith Meter Inc model PPST pulse generator, or any other compatible (#) NMI-approved measurement transducer.

(#) 'Compatible' is defined to mean that no additions/changes to the hardware/software specified in this approval are required for satisfactory operation of the complete system.

1.4 Non-Linearity Correction Facility

A multi-point correction facility is available, which allows up to four meter factors in the range 0 to 9.99999 to be programmed as a function of flow rate within the approved range. The ALIII-S controller applies interpolation processes to calculate the meter factor for the current flow rate based on the meter factor programmed for the next highest and the next lowest flow rate.

1.5 Checking Facilities

- A segment check is performed for the selected volume display when the loading/arm is selected. The segment check can also be performed by entering the diagnostic mode, and then selecting Display pixel test.
- Monitors the dual output signal from the measurement transducer.
- Outputs are provided to control solenoid-operated valves to control the delivery process and prevent measurements when errors are detected, e.g. when temperature measurements are outside the approved range.
- To display the delivered volume during power failure, an uninterruptible power supply (UPS) is required. The UPS design must include:
 - (a) the capacity to allow for display of data on all ALIII-S controllers (58 Watts/unit) for a period of 30 minutes; and
 - (b) a monitoring system providing a low battery alarm to the Loading Control Room.

1.6 Operational Procedures

The ALIII-S controller is predominately designed to automatically control the delivery of a flowmetering system based on the entered pre-set volume and the pre-programmed flow profile.

The following is a typical operating sequence, however each site may require a different operating procedure.

- Connect overfill protection system
- Enter driver personal identification number (PIN)
- Select the required loading arm/line
- Press the *set* button (initiates a segment check on selected indicator)
- Enter pre-set quantity
- Press start or stop
- Enter another load

To display various metered data press Enter key, select load arm, press Enter key, and select Product.

1.7 Flow Control Valve

Any compatible (#) solenoid-operated flow control valve, located downstream of the flowmeter, may be interfaced to the ALIII-S controller for controlling the delivery process and to stop measurements in the event of errors detected by the checking facility.

- (#) 'Compatible' is defined to mean that no additions/changes to the hardware/software specified in this approval are required for satisfactory operation of the complete system.

1.8 Temperature Probe

For temperature measurement applications and for volume conversions, a Fisher-Rosemount model 0065, PT 100 4-wire 100 ohm RTD or any other compatible (#) temperature transducer may be used.

- (#) 'Compatible' is defined to mean that no additions/changes to the hardware/software specified in this approval are required for satisfactory operation of the complete system.

1.9 Volume Conversion For Temperature Facility

An electronic volume conversion for temperature facility can be enabled to convert the measured volume to volume at 15°C. The conversion is based on *ASTM-IP-API Petroleum Measurement* Table 54A for Crude Oils, or Table 54B for Generalised Petroleum Products, or Table 54C for pure biodiesel, or Table 54D for Lube Oils, where the density is set for the product for which the instrument is verified.

1.10 Markings and Notices

A. Instruments are marked with the following data, together in one location:

Pattern approval number	NMI (or NSC) S413
Manufacturer's identification mark or trade mark
Model number
Serial number of the instrument
Year of manufacture
Environmental class	class C
Type of liquid for which the system is verified (*)
Maximum temperature of the liquid (T_{max})	50°C (*)
Minimum temperature of the liquid (T_{min})	-10°C (*)

- (*) Required when volume conversion for temperature is utilised.

B. For applications (other than LPG) when the delivered volume is at 15°C the indicator is marked, 'Volume at 15°C' or 'Litres at 15°C'.

Note: The minimum measured quantity specified for the meter shall be programmed into the AccuLoad III controller to prevent deliveries less than the specified minimum delivery for the flowmeter to which the controller is interfaced.

1.11 Sealing Provision

Provision is made for the calibration adjustments to be sealed by means a lead wire sealed passing through two long screws at the side of the indicator (Figure 2). Note that calibration parameters can also be changed electronically via PIN access code.

A data log of the changes is provided.

1.12 Verification Provision

Provision is made for the application of a verification mark.

2. Description of Variant 1

approved on 10/04/03

Certain other models of the AccuLoad III ALIII series loading controllers as listed below:

- ALIII-S-XP-ALX1-A***** for use with a single loading arm; and
- ALIII-Q-XP-ALX#-A*****

where:

- * relates to optional hardware such as analogue input/output boards for temperature probe(s) and hardware for specific process control not subject to approval.
- # denotes the number of loading arms and is any digit from 1 to 6, inclusive.

Figure 3 shows a typical ALIII-Q series controller, which is similar to the pattern but incorporates two displays mounted in a larger enclosure with provision for the additional optional boards.

3. Description of Variant 2

approved on 19/05/08

Various models of the AccuLoad III.net ALIII series of loading controllers.

Instruments have the same model numbers as described for the pattern and variant 1, namely ALIII-S and ALIII-Q (*) and have the same features and capabilities and in addition the AccuLoad III.net series has four serial communication ports plus one ethernet port allowing continuous monitoring of critical functions, real time data capture from local and remote locations, local and remote on-line diagnostics, network compatibility, email/text message alert and support for diagnostic alarms, flash memory upgrade, using version 11.xx software.

- (*) Abbreviated model numbers – the full model number for the pattern is ALIII-S-XP-ALX2-A20000.

4. Description of Variant 3

approved on 19/05/08

With an AccuLoad III series controller (the pattern) or AccuLoad III.net series controller (variant 2) combining the output of two meters where two fuels are being blended for delivery by a single loading arm.

The controller controls the blending ratio and provides the summation of the volumetric output of the two meters.

A typical summing procedure is shown in Table 1.

TABLE 1



Press ENTER on the Accuload KeyPad to access Main Menu.



Select Dynamic Displays, and press ENTER.



Select the associated blending arm (arm 1 in this case) and press ENTER.



This will be the summation of the final product.

TEST PROCEDURE No S413

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures and in accordance with any tests included in the approval documentation for the system in which the pattern is fitted, and in accordance with any relevant tests.

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 applicable are those applicable to the fuel dispensers to which the instrument approved herein is fitted, as stated in the approval documentation for the fuel dispensers or in Schedule 1 of the *National Trade Measurement Regulations 2009*.

For checking the linearity correction facility, refer to the operating manual.

Check that the minimum measured quantity specified for the flowmeter is programmed into the loading controller to prevent deliveries less than the specified minimum delivery for the flowmeter to which the controller is interfaced.

Tests

Recommended Procedure For Systems With Volume Conversion For Temperature Facility Enabled

1. Verify the accuracy of the flowmeter for the arm/line selected using the displayed metered volume at operating conditions (unconverted volume).
2. For each delivery, record the volume at 15°C, the set density and the average temperature displayed by the instrument. Verify that the density setting is within $\pm 1 \text{ kg/m}^3$ for Class 0.5 applications, and that temperature measurement is within $\pm 0.5^\circ\text{C}$.
3. For the temperature and density displayed by the instrument, use the appropriate petroleum tables to determine the volume conversion factor and calculate the volume at 15°C. The maximum permissible error between the calculated volume at 15°C and the volume at 15°C displayed by the instrument is 0.05% for Class 0.5 applications.

Notes:

- (i) Refer to clause **1.6 Operational Procedures** to obtain the required readings of volume at 15°C.
- (ii) When verifying the accuracy of the flowmeter, it is recommended that this be done with a single k-factor and the linearity correction facility disabled. Once the linearity of the flowmeter has been established, the appropriate meter factors as a function of flow rate can be calculated and entered into the instrument. A final calibration check shall be carried out to check for correct implementation of the linearisation factors entered.

FIGURE S413 – 1



Smith Meter Inc AccuLoad III Model ALIII-S Controller for Liquid-measuring Systems

FIGURE S413 – 2



Typical Mechanical Sealing

FIGURE S413 – 3



Typical Smith Meter Inc AccuLoad III ALIII-Q Series Controller

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