Australian Government
Department of Industry, Science and Resources

National Measurement Institute

36 Bradfield Road, West Lindfield NSW 2070

Certificate of Approval
NMI 9/2/6

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.

Alfons Haar Model PreciGAUGE Vehicle Tank Static Measuring System

submitted by HAAR Australia Pty Ltd
1/2 East Circuit
Sunshine West VIC 3020

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, dated May 2021.

This approval is subject to review at the decision of the Chief Metrologist in accordance with the conditions specified in the document NMI P 106.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern provisionally approved – interim certificate issued	30/11/17
1	Pattern approved – certificate issued	14/02/24

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with approval number 'NMI 9/2/6' and only by persons authorised by the submittor.

Instruments purporting to comply with this approval and currently marked 'NMI P9/2/6' may be re-marked 'NMI 9/2/6' 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.

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

Special Conditions of Approval (Vehicle Tanks – road and rail):

Static level gauging systems for vehicle tanks to measure and display a volume of liquid by measuring the level of liquid contained in a compartment of a vehicle tanker with respect to a fixed reference. The known dimensions of a compartment are used by the system to calculate the volume of liquid in the compartment from the height measured.

The system shall only be installed on a vehicle tanker that has been designed according to General Certificate 9/0/B *Vehicle Tanks of Capacities 0.5 to 105 kilolitres*, or other compatible (#) **NMI approved Vehicle Tank.**

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

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

Darryl Hines
Manager
Policy and Regulatory Services

TECHNICAL SCHEDULE No 9/2/6

1. Description of Pattern **provisionally approved on 30/11/17**
approved on 14/02/24

An Alfons Haar Model PreciGAUGE static level gauging system (Figure 1) for vehicle tankers, approved for measuring the quantity of liquid hydrocarbon products other than LPG in the tank/compartments. The system is approved to measure partial volume delivered or received.

1.1 Field of Operation

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

- Minimum measured quantity, V_{min} ….. *L* (#1)
- Inclination from horizontal ±5°
- Dynamic viscosity, η (at 20°C) 0.4 to 20 mPa.s (#2)
- Liquid temperature range –10°C to 50°C
- Ambient temperature range –25°C to 55°C
- Voltage of road vehicle battery 24 VDC (nominal)
- Accuracy class for system Class 0.5
- Applications Road and rail tankers

(#1) The minimum measured quantity (V_{min}) **must be specified for each compartment** using the following calculations:

a) must be given as either 1 x10^n, 2 x10^n or 5 x10^n litres where *n* is a whole number, or a multiple of 100 litres
b) equal to or greater than the volume corresponding to 200 mm difference in liquid level at the section of the tank/compartment with the smallest sensitivity (i.e. millimetres per litre).
c) not exceed one quarter (¼) of the nominal capacity of each compartment.

V_{min} calculation:

V_{min} = 200 x (“LITRES/mm” at the widest part of the tank/smallest sensitivity)

Example: 2610L tank; 2.2L/mm widest; V_{min} = 200*2.2 rounded up = 500L

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

Note: The instrument may replace any other gauge approved for a vehicle-mounted tanker.

1.2 The System

This automatic tank gauging system measures the liquid level in a horizontal tank (measuring vessel), with an electronic dipstick positioned in the centroid of the compartment giving compensation for the angle of inclination, in longitudinal and lateral 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 and is derived from the measured level in the compartment. The external valve (API coupling or Manifold valve) is deemed to be the transfer point – this can be achieved by gravity or pumped discharge.

The electronic dipstick operates using a magneto restrictive property with a float moving along a stainless steel probe tube and contacting the surface of the liquid in the tank. The float affects a magnetic field which is used to detect the position of the float along a stainless steel probe tube and determine the corresponding liquid level. The calibrated properties of the tank or compartment are then used to determine the volume of liquid at that level and the difference in level for the volume transferred.

1.3 Components of the Measuring System

The system includes:

- A tank which may have one or more separate compartments, and which is designed to comply or **any NMI approved Vehicle Tank** (see special conditions).
- The PreciGauge is powered by the tank truck battery (24 V DC nominal) as the power supply.
- A FAFNIR model 908734-XXX series electronic dipstick. (xxx defines the length of the dipstick) (Figure 2).
- An Alfons Haar Model CountMASTER 4A calculator/indicator unit (Figure 3) with a liquid crystal type display. The calculator/indicator unit may also be known as: *GuardMASTER, ARUMASTER*.

1.5 Auxiliary Flowmeter

The PreciGAUGE system may be installed as a standalone system or on the PreciPURE or PreciTURBO liquid measuring system as described in the documentation of approval NMI 5/6B/218 (Figure 4).

1.6 Verification Provision

Provision is made for the application of a verification mark.

For systems installed on a vehicle tank having multiple compartments and these are verified separately, provision shall be made for the verification mark to identify and be associated with the compartment that has been verified.

For systems installed on the Auxiliary Flowmeter system described in 1.5, where the level gauging system is verified separately, provision shall be made for the verification mark to identify and be associated with each system that has been verified.

1.7 Sealing Provision

Provision is made for the PreciGAUGE to be sealed by sealing bolts and wires outside the gauge, and by a write-protection switch on the CPU module of the CountMASTER 4A calculator/indicator (Figure 5).

1.8 Descriptive Markings and Notices

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

Pattern approval number	NMI 9/2/6
Manufacturer's identification mark or trade mark	…..
Model number	…..
Serial number	…..
Year of manufacture	…..
Liquid temperature range	… to …°C
Maximum measured quantity, V_{max}	….. Litres
Minimum measured quantity, V_{min}	….. Litres (^)
Maximum inclination	$\pm 5^{o}$
Accuracy class	class 0.5

(^) the volume 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

In addition, tanks shall comply with any relevant requirements given in NITP 9 *National Instrument Test Procedures for Vehicle Tanks* in regard to markings, numbering and notices.

TEST PROCEDURE 9/2/6

Verification of the measuring system can only be performed on a calibrated vehicle tank. Prior to verification, the calibration of the tank, leak tests and pressure tests shall have been performed and documented.

The tank can be calibrated and tested 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* in terms of:

The measuring system 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 (MPE), for the transferred volumes are:

1. For transferred volumes (V) equal to or greater than the minimum measured quantity (V_{min}) and up to twice the minimum measured quantity, the minimum specified volume deviation (E_{min})
   The minimum specified volume deviation is twice the absolute value of the maximum permissible error for the minimum measured quantity of the compartment

   i.e: $E_{min} = V_{min} \times 2 \times (0.5 / 100)$
2. For transferred volumes greater than twice the minimum measured quantity, ±0.5%

Note: For calculating errors, the transferred volumes are determined using the static volume measurements indicated by the instrument before and after a delivery, which is compared with the transferred reference volume measured using suitable traceable reference standard(s) of measurement.

Accuracy test:

The test shall be carried out with the tank in normal position with an inclination of no greater than ± 0.2°)

The measuring system shall be verified at an appropriate number of volume levels across the full measuring range of the level sensor, that ensure for any combination of liquid levels in the compartment, the deliveries to or from the compartment greater than the minimum measured quantity are within the MPE for that delivery.

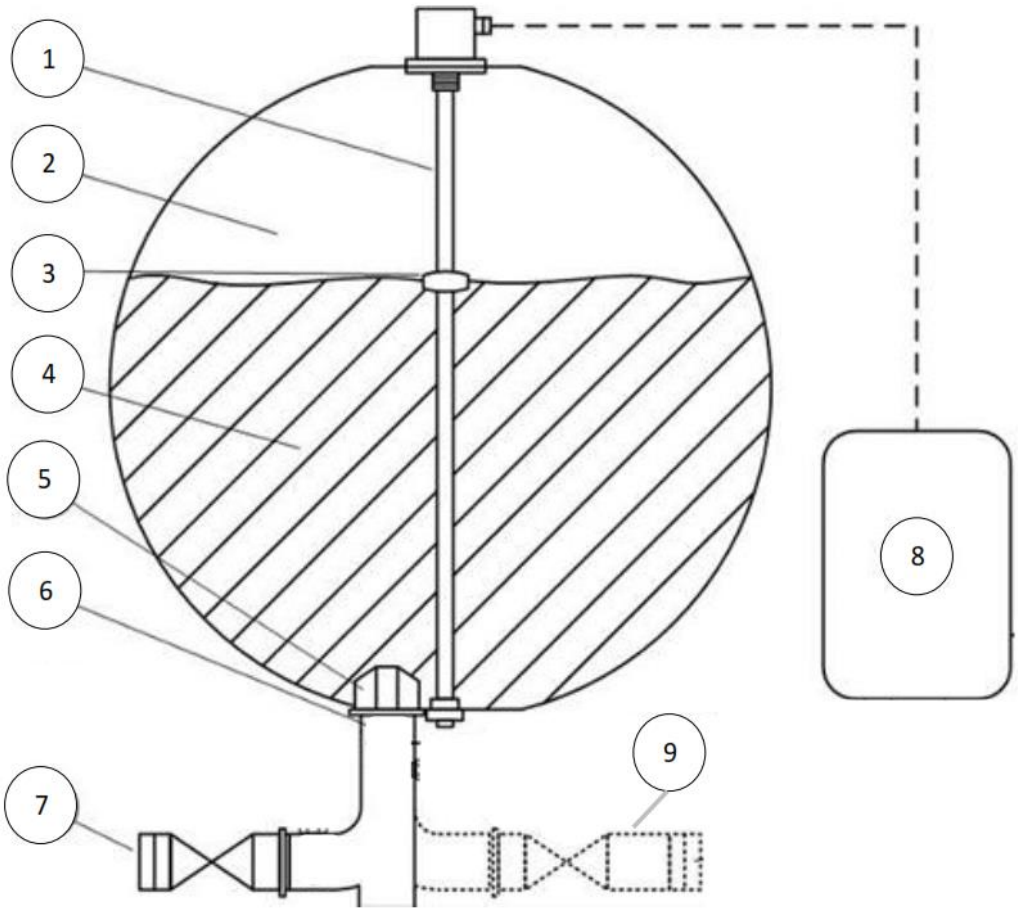
The verification may be carried out by either delivering a traceable volume into the tank compartment, or alternatively by dispensing the liquid from the tank compartment via traceable volume measuring equipment.

The accuracy of reference volume needs to be equal to or better than 3 times than the MPE for the delivery volume being tested.

Selected volume levels shall include multiple levels across the most sensitive part of the tank/compartment.

The errors of all transferred volumes between any combination of measured levels that correspond to a volume greater than or equal to the minimum measured quantity shall be calculated. The error of each calculated transfer volume shall be within the maximum permissible errors given above.

FIGURE 9/2/6 – 1



1. Filling level sensor
2. Measuring vessel/measuring chamber
3. Float
4. Product
5. Bottom valve
6. Outlet pipe
7. Dry coupling (API)
8. XMaster controller
9. Other options PreciControl

Alfons Haar Model PreciGAUGE Vehicle Tank Measuring System

FIGURE 9/2/6 – 2

A FAFNIR Model 908734-XXX Series Electronic Dipstick

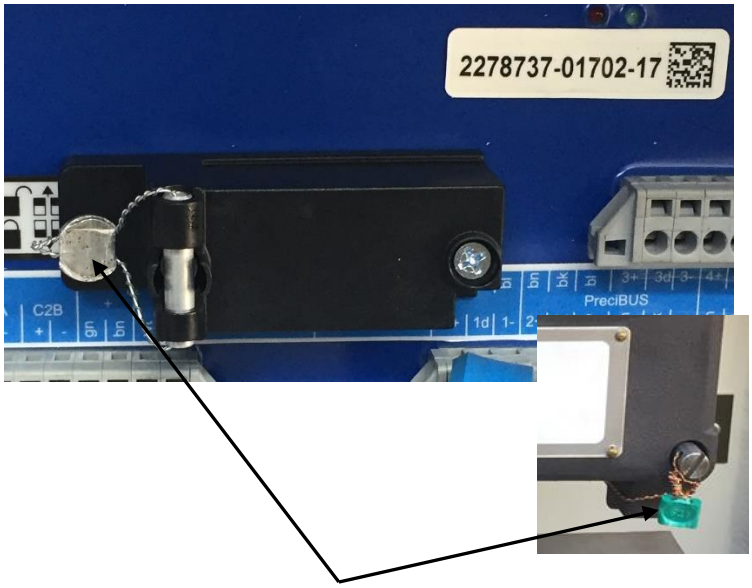
FIGURE 9/2/6 – 3

An Alfons Haar Model CountMASTER 4A Calculator/Indicator Unit
(also known as GuardMASTER, ARUMASTER)

FIGURE 9/2/6 – 4

Alfons Haar Model PreciTURBO Bulk Flowmetering System Hydraulics NMI 5/6B/218

FIGURE 9/2/6 – 5



Typical Sealing Method/s

~ End of Document