Australian Government
Department of Industry and Science

National Measurement Institute

Certificate of Approval

NMI 12/1/9

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.

BAUER KOMPRESSOREN Model CNG-D-SH-1-50 Mass Compressed Gaseous Fuel Measuring System

submitted by BAUER KOMPRESSOREN Australia Pty Ltd
2/35 Hallstrom Place
Wetherill Park NSW 2164

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 139, Compressed Gaseous Fuel Measuring Systems for Vehicles, dated March 2011.

This approval becomes subject to review on 1/08/20, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 provisionally approved – interim certificate issued	5/07/13
1	Pattern & variant 1 amended (test procedure) – interim certificate issued	27/09/13
2	Pattern & variant 1 approved – interim certificate issued	1/10/14
3	Pattern & variant 1 approved – certificate issued	6/02/15
4	Variant 2 approved – certificate issued	5/08/15

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number ‘NMI 12/1/9’ and only by persons authorised by the submittor.

Instruments purporting to comply with this approval and currently marked ‘NMI P12/1/9’ may be re-marked ‘NMI 12/1/9’ 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 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 12/1/9

1. Description of Pattern **provisionally approved on 5/07/13 approved on 6/02/15**

A BAUER KOMPRESSOREN model CNG-D-SH-1-50 single mass fuel measuring system for refuelling motor vehicles using compressed gaseous fuel. Instruments are approved for attendant-operated mode, or in attended self-service mode when interfaced to a compatible (#) approved fuel dispenser controller.

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

1.1 Field of Operation

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

- Minimum measured quantity, M_{min} 2 kg
- Maximum flow rate, Q_{max} 50 kg/min
- Minimum flow rate, Q_{min} 2 kg/min
- Maximum pressure in the refuelling station gas storage P_{st}, 30 MPa
- Maximum fast fill pressure of the gas P_v, 25 MPa
- Ambient temperature range -25°C to 55°C
- Accuracy Class 1.5
- Nature of fuels to be measured, e.g. natural gas, biogas (predominately methane)

1.2 Components of the Measuring System

The BAUER KOMPRESSOREN model CNG-D-SH-1-50 single mass fuel measuring system (Figures 1 and 2) and has components as detailed below.

(i) Measurement Transducer

A Micro Motion MVD flowmetering system consisting of a Micro Motion model CNG050 (*) flow sensor (Figure 3) fitted with Micro Motion MVD 'Direct Connect' componentry which allows the sensor to communicate directly with the dispenser electronics via Modbus – no transmitter required.

(*) Basic model number only – the full model number may have a variety of additional alphanumeric characters, which designate non-metrological features.

(ii) Calculator/Indicator

A Gallagher model Orange P13001/P13003 electronic price-computing calculator/ indicator (Figures 1 and 4) compatible to receive electrical Modbus signals from a Micro Motion model CNG050 mass flow sensor.

The unit of measurement for measured quantities is kg.

The unit of measurement for price and unit price is dollars ($) or cents (c).

(iii) Outlet Piping

The pipework from each meter to its hose includes isolating valves.

(iv) Hose, Nozzle and Transfer Point

The delivery hose has a nominal bore of approximately 10 mm and may have a return vent line having a nominal bore of approximately 3.2 mm.

The delivery hose and the return vent line are fitted with hose-break couplings.

The transfer point is in the form of a Staubli NGV1 model GMV08 or equivalent (*) fill coupling, fitted with an integral fill/vent valve which starts and stops the flow of gas. A bleed valve is also fitted to vent the gas between the hose-break coupling and the transfer point.

(*) '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.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Sealing Provision

Provision is made for the flowmeter to be sealed by the application of one or more mechanical seals (Figure 3)

Provision is made for the Central Processor to be sealed by the application of one or more tamper-evident labels (Figure 5).

1.5 Descriptive Markings and Notices

Instruments carry the following markings, together in one location:

Manufacturer's mark, or name written in full	.....
Model designation	.....
Serial number of the instrument	.....
Pattern approval mark for the instrument	NMI 12/1/9
Maximum flow rate	..... kg/min
Minimum flow rate	..... kg/min
Minimum delivery (*)	..... kg
Maximum operating pressure	..... 30 MPa

(*) Marked on the fuel dispenser indicator.

2. Description of Variant 1 provisionally approved on 5/07/13 approved on 6/02/15

Certain other models of the CNG-D series of mass fuel measuring systems as listed in Table 1 below. All systems use the Micro Motion model CNG050 mass flow sensor.

TABLE 1

System Model	Meters/Hoses	Supply Storage Banks
CNG-D-SH-3-50	Single	3
CNG-D-DH-1-50	Dual	1
CNG-D-DH-3-50	Dual	3

3. Description of Variant 2 approved on 5/08/15

Dispensers now fitted with ‘START FILL’ and ‘STOP FILL’ switches to each side as shown in Figure 6.

TEST PROCEDURE

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 Schedule 1 of the *National Trade Measurement Regulations 2009*.

The maximum permissible errors are:

(i) For measured quantities for the complete measuring system, the maximum permissible error is:

±2.0%

(ii) For quantities at or near the minimum measured quantity (M_{min}), the maximum permissible error would be the greater of either:

(a) ±2.0%; or

(b) the minimum specified mass deviation (E_{min}) which is calculated using the following formula:

$E_{min} = 3 \times M_{min}/100$

where: M_{min} is the minimum measured quantity.

For an M_{min} of 2 kg, then E_{min} = 60 g

Note: The minimum specified mass deviation (E_{min}) is an absolute maximum permissible error.

Instruments shall be tested in accordance with the tests specified below.

Tests

1. Scope

Tests shall be carried out using the gravimetric system as set out below, or using an approved master meter.

2. Equipment

2.1 A suitable weighing instrument with a scale interval not greater than 20 g, and which is able to provide the required weighing measurements with an uncertainty not greater than ±0.67%.

2.2 Certified test masses of at least 10 kg.

2.3 Three, 60 litre compressed natural gas (CNG) cylinders.

2.4 Necessary valves, hoses and couplings to be able to fill and empty the cylinders.

2.5 A stopwatch to determine the flow rate.

3. Procedure

3.1 Measured quantity test

3.1.1 Set up the weighing instrument on a flat surface and out of the wind. Level the instrument, switch on, and allow for any warm-up time.

3.1.2 Zero the instrument and place the empty cylinder on the weighing platform. Either note the mass of the empty cylinder or tare off the mass of the cylinder.

3.1.3 Remove the cylinder from the weighing platform and place it in the vicinity of the fuel dispenser.

3.1.4 Connect the nozzle/hose of the fuel dispenser to the cylinder. Authorise the dispenser, open the cylinder valve, then open the refuelling nozzle and make a delivery at the maximum achievable flow rate until the cylinder is approximately 75% full. Time the filling process and determine the nominal flow rate.

3.1.5 Close the cylinder valve and the refuelling nozzle and return the nozzle/hose to the dispenser.

3.1.6 Record the quantity **(mass)** displayed by the fuel dispenser.

3.1.7 Place the cylinder on the weighing platform and record the mass (kg) indicated. Subtract the tare mass of the cylinder if the cylinder has not been tared off to obtain the mass of the gas delivered.

3.1.8 Determine the relative error as follows:

$$\frac{\text{(quantity displayed - quantity delivered)} \times 100}{\text{quantity delivered}} \ \%$$

3.1.9 Remove the partly-filled cylinder from the weighing platform and place it near to the dispenser. Connect the nozzle/hose of the fuel dispenser to the partly-filled cylinder and perform a test at or near the minimum measured quantity (M_{min}).

3.2 Testing at or near the minimum measured quantity (M_{min})

3.2.1 Perform a test at or near the minimum measured quantity by completing the delivery into the cylinder until the flow stops. Time the filling process and determine the flow rate.

3.2.2 Close the cylinder valve and the refuelling nozzle and return the nozzle/hose to the fuel dispenser. Record the quantity displayed by the dispenser.

3.2.3 Place the cylinder on the weighing platform and record the total mass of gas delivered into the cylinder. To determine the mass of gas delivered for the slow flow rate test, subtract the mass of gas delivered for the fast flow rate test.

3.3 Repeat steps 3.1.2 to 3.2.3 with at least two more test cylinders.

3.4 Check that all results are within the maximum permissible error.

3.5 Check price calculations for the quantities delivered and the unit price settings.

FIGURE 12/1/9 – 1

BAUER KOMPRESSOREN Model CNG-D-DH-3-50 Mass Compressed Gaseous Fuel Measuring System

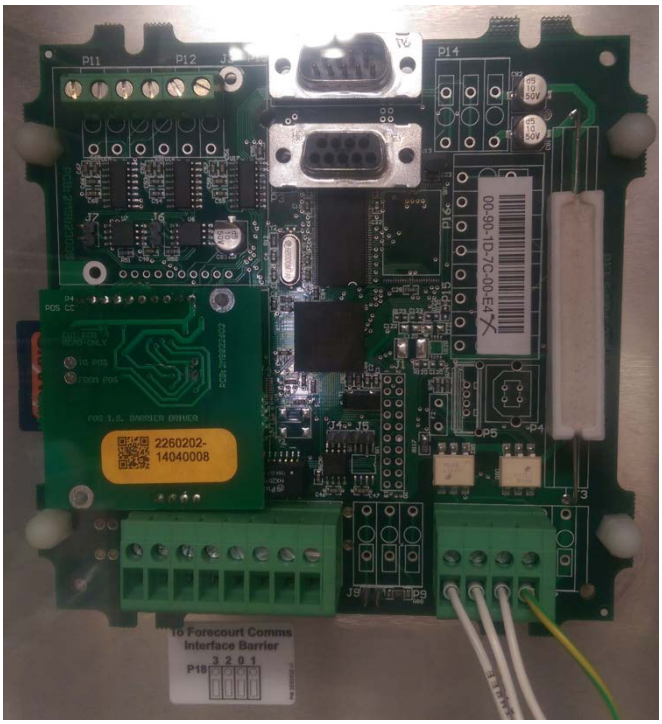
FIGURE 12/1/9 – 2

BAUER KOMPRESSOREN Model CNG-D-SH-1-50 Hydraulics

FIGURE 12/1/9 – 3

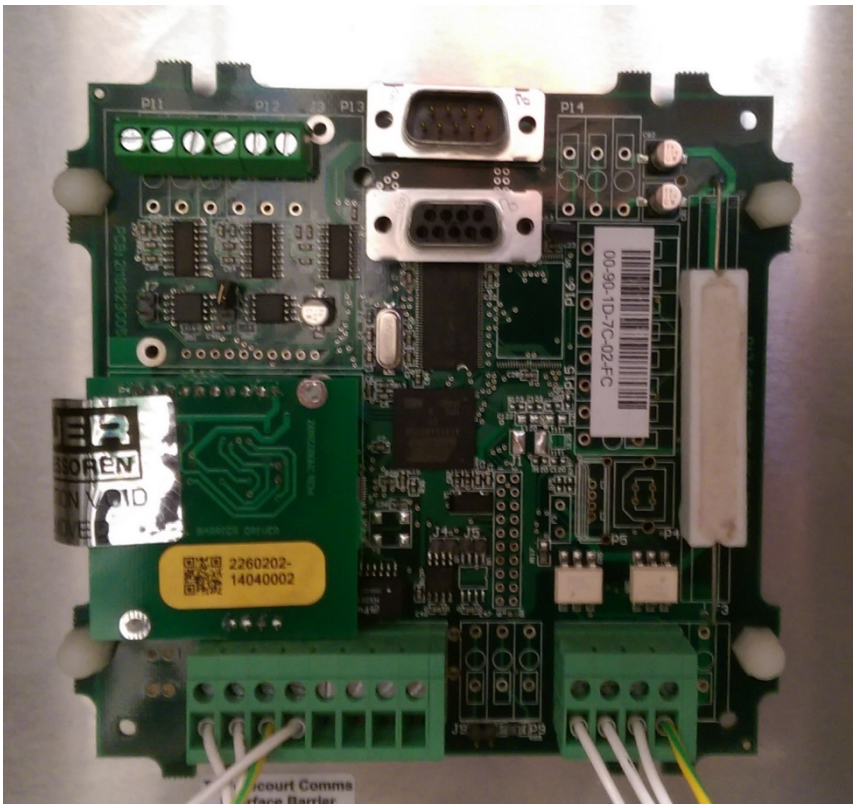
Micro Motion Model CNG050 Flow Sensor Incl. Typical Mechanical Sealing

FIGURE 12/1/9 – 4



BAUER KOMPRESSOREN Model CNG-D-DH-3-50 Central Processor

FIGURE 12/1/9 – 5



BAUER KOMPRESSOREN Model CNG-D-DH-3-50 Tamper-evident Label

FIGURE 12/1/9 – 6

With Additional ‘START FILL’ & ‘STOP FILL’ Switches (Variant 2)

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