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

Certificate of Approval

No 5/6B/212

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.

Endress+Hauser Model Promass 84 F DN 250 Mass Bulk Flowmetering System

submitted by Endress+Hauser Australia
Unit 8, 277 Lane Cove Road
North Ryde NSW 2113

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 **1/08/17**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 4 approved – interim certificate issued	24/07/07
1	Pattern & variants 1 to 4 approved – certificate issued	14/02/08
2	Pattern amended (return valve option) – notification of change issued	29/01/09
3	Pattern & variants 1 to 4 reviewed & updated – certificate issued	18/02/13

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number ‘NMI 5/6B/212’ 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 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/212

1. Description of Pattern approved on 24/07/07

An Endress+Hauser model Promass 84 F DN 250 mass flowmetering system (Figure 1 and Table 1) for bulk metering of liquids 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} or M_{min} 1000 kg
- Maximum flow rate, Q_{max} 37 000 kg/min
- Minimum flow rate, Q_{min} 1500 kg/min
- Maximum pressure of the liquid, P_{max} 10 000 kPa
- Density range 400 to 1400 kg/m³
- Ambient temperature range -25 to 55°C
- Accuracy class 0.3
- Power supply range 20 to 55 V DC/16 to 62 V AC
  85 to 264 V AC

1.2 The Flowmetering System (Figure 1)

(i) Supply Tank

To ensure air does not enter the pipework, the supply tank incorporates a device for detecting low liquid level.

(ii) Pump

A positive displacement, centrifugal or submersible turbine type pump may be used to provide flow through one or more flowmeters. The pump is fitted in a positive suction head (flooded suction) installation, i.e. below the liquid level in the supply tank (Figure 1).

For all combination of usage, the pump(s) shall be of sufficient capacity to ensure that each flowmeter can operate within its approved flow rate range.

(iii) Non-return Valve

A non-return valve may (or may not) be fitted at least between the pump and the flowmeter to prevent the reverse flow of the liquid and keep the flowmeter full of liquid at all times.

(iv) Gas Elimination Device

A gas elimination device need not be fitted as the flowmetering system is designed to keep the pipework full of liquid at all times, and on the occasion that small amounts of vapour may form in the pipework, the mass of this vapour will be insignificant compared to the mass of liquid.

(v) Measurement Transducer

The measurement transducer of the pattern comprises an Endress+Hauser model Promass 84 F DN 250 flow sensor (Figure 2) interfaced to an Endress+Hauser model Promass 84 microprocessor-based transmitter (Figure 3a) designed to provide pulse output signal proportional to the mass throughput. The transmitter is connected to an AC or DC power supply. The transmitter may be fitted with a liquid crystal display however this display is not approved for trade use.

The Promass flow sensor may be used for measuring volume and density. The minimum and maximum volumetric flow rate is derived from the mass flow rates divided by the density of the liquid. The V_{min} is equal to the M_{min} divided by the density. The volume and density outputs can only be applied for trade measurement purposes if at least one of the following two conditions is met:

1. A special density calibration, prior to installation in the field, has been performed.
2. A standard density calibration followed by a density calibration in the field on the liquid to be measured, has been performed.

The Promass 84 transmitter may have the following output options:

- single or double pulse, 90 degree or 180 degree phase shifted pulse-output for the transmission of volume or mass information;
- 4-20 mA output for the transmission of density (can also be used for input/output via HART protocol;
- status input or output; or
- MODbus 485 serial protocol.

The Promass flow sensor may be used for bi-directional measurements when delivering quantities greater than V_{min} or M_{min}.

For verification purposes, provision is made for inserting a thermometer and connecting a pressure gauge to measure the temperature and pressure of the liquid at the flowmeter.

(vi) Controller/Indicator

A Contrec model 1010A controller/indicator, or any other compatible approved controller/indicator, is used to do all required flow computations. The model 1010A is described in the documentation of approval NMI S313A.

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

(vii) Transfer Device

A transfer device, which defines the start and stop of the quantity measured, is installed downstream of the mass flowmeter. The transfer device is in the form of a positive shut-off component such as a manually or automatically-operated shut-off valve.

The transfer device may also be designed to control the flow rate within the specified flow rate range of the flowmeter.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Sealing Provision

Provision is made for sealing the cover of the transmitter which contains the calibration functions of the instrument (Figure 3b).

1.5 Markings and Notices

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

Manufacturer's identification mark or trade mark	…..
Meter model	…..
Serial number of the instrument	…..
Pattern approval mark	NMI 5/6B/212
Year of manufacture	…..
Maximum flow rate, Q_{max}	….. kg/min
Minimum flow rate, Q_{min}	….. kg/min
Maximum pressure of the liquid, P_{max}	….. kPa
Type of the liquid for which the system is verified	..... (#)
Environmental class	class C or I

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

The minimum measured quantity (V_{min} or M_{min}) is clearly visible on the indicating device, e.g. 'Minimum Delivery 1000 kg', or alternatively the controller/indicator is programmed for deliveries equal to or greater than the stated minimum delivery.

2. Description of Variant 1 **approved on 24/07/07**

The pattern and variants for use to dispense various petrol/ethanol blends and pure ethanol ('E100').

3. Description of Variant 2 **approved on 24/07/07**

The pattern and variants constructed for use to dispense various grades of pure biodiesel and biodiesel/distillate blends (to Australian government standard).

4. Description of Variant 3 **approved on 24/07/07**

The model Promass 84 transmitter in certain alternative housings (Figure 4).

5. Description of Variant 4 **approved on 24/07/07**

A bulk flowmetering system using any model of the Endress+Hauser Promass 84 A, 84 M or 84 F series of flow sensors (Figure 5) listed in Table 1.

TABLE 1

Sensor Series	Sensor Model	Size (mm)	Mass Flow Rate Maximum (kg/min)	Mass Flow Rate Minimum (kg/min)	Minimum Quantity (*) (kg)
A	DN 2	2	2	0.1	0.05
A	DN 4	4	8	0.4	0.2
F or M	DN 8	8	30	1.5	2
F or M	DN 15	15	100	5	5
F or M	DN 25	25	300	15	20
F or M	DN 40	40	700	35	50
F or M	DN 50	50	1000	50	20
F or M	DN 80	80	3000	150	200
F	DN 100	100	4500	200	200
F	DN 150	150	12 000	250	500
F	DN 250	250	37 000	1500	1000

(*) For minimum measured quantities (V_{min} or M_{min}) less than 200 kg, the scale interval of the calculator/indicator is 0.1 kg; for deliveries greater than 200 kg the scale interval is 1 kg.

TEST PROCEDURE No 5/6B/212

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures. Tests should be conducted in conjunction with any tests specified in the approval documentation for any controller/indicator and/or any conversion device, etc. used.

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*.

Tests

The mass flowmeter may be verified gravimetrically by comparing the indicated mass (conventional weight in air) against the weight of the contents delivered into a container on a certified weighing instrument.

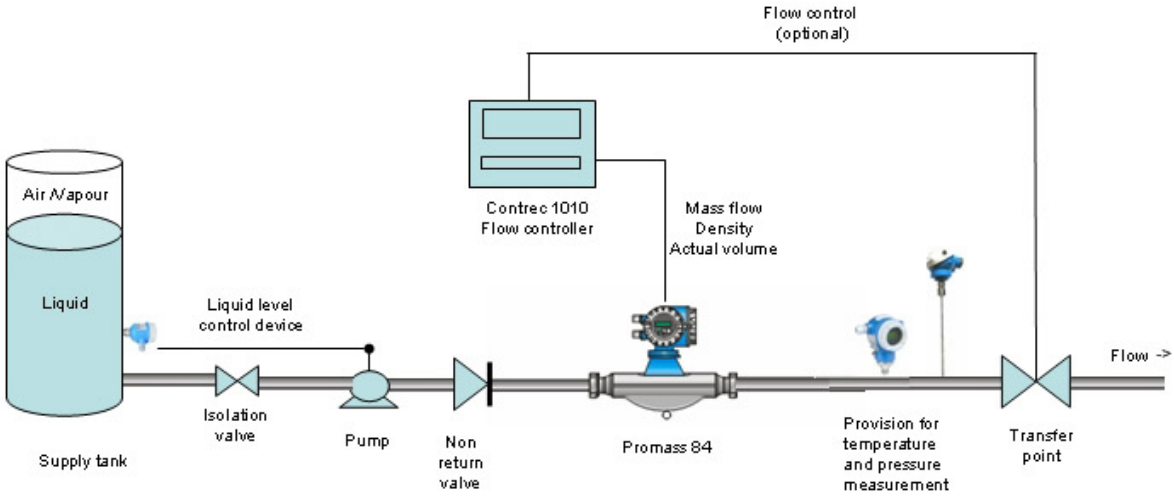
Alternatively, the mass flowmeter may verified volumetrically by manually converting the measured mass to volume, using the measured density of the liquid and the appropriate Tables to obtain the conversion factors for thermal expansion and compressibility of the measured volume of liquid.

Mass flowmetering systems indicating volume at operating conditions can be verified volumetrically by converting both the measured volume and the volume indicated by the flowmetering system to a volume at reference temperature (15ºC) and reference pressure (101.325 kPa absolute pressure).

Mass flowmetering systems indicating volume at 15ºC must be verified in two stages.

The first stage is to verify the accuracy of the volume measured by the flowmetering system with the controller/indicator displaying volume at operating temperature (refer to configuration of the controller/indicator) and the second stage is to check that the controller/indicator is correctly converting the metered volume to a volume at 15ºC.

FIGURE 5/6B/212 – 1



Endress+Hauser Model Promass 84 F Mass Bulk Flowmetering System

FIGURE 5/6B/212 – 2

Endress+Hauser Model Promass 84 F DN 250 Flow Sensor

FIGURE 5/6B/212 – 3

(a) Endress+Hauser Model Promass 84 Transmitter

(b) Sealing of Model Promass 84 Transmitter

FIGURE 5/6B/212 – 4

Model Promass 84 Transmitter in Alternative Housings

FIGURE 5/6B/212 – 5

(a) Promass 84 A Series Flow Sensor

(b) Promass 84 M Series Flow Sensor

~ End of Document ~