



Australian Government
**Department of Industry,
Science and Resources**

**National
Measurement
Institute**

36 Bradfield Road, West Lindfield NSW 2070

Certificate of Approval
NMI 5/6B/233

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.

Daniel Model Series 1200 Turbine Liquid-measuring System

submitted by Daniel Measurement and Control.
9750 W. Sam Houston Parkway N.
Suite 100
Houston Texas 77064
USA

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 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 & Variant 1 approved – certificate issued	08/07/24

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 5/6B/233' 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 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*.



Darryl Hines
Manager
Policy and Regulatory Services

TECHNICAL SCHEDULE No 5/6B/233

1. Description of Pattern

approved on 08/07/24

A Daniel model 1200 bulk flow metering system incorporating a Daniel Model 1200 Turbine Flow meter (Figure 1 and Table 1) with dual inductive pick-off coils and pre-amplifier element as listed in Table 1 below for bulk metering of petroleum products other than LPG.

TABLE 1 – Daniel Series 1200

Diameter (mm)	Minimum Flow Rate (Q_{min}) (L/min)	Maximum Flow Rate (Q_{max}) (L/min)	Minimum Measured Quantity (V_{min}) (L)
80	250	2500	200
100	380	3800	200

Note: The flow rates must be at least a 10:1 ratio, maximum to minimum

1.1 Field of Operation

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

- Minimum measured quantity (V_{min}) see table 1 (#1)
 - Maximum flow rate (Q_{max}) see table 1
 - Minimum flow rate (Q_{min}) see table
 - Maximum pressure of the liquid (P_{max}) 15102 kPa
 - Minimum pressure of the liquid (P_{min}) 200 kPa (nominal) (#2)
 - Range of liquids viscosity 0.5 to 20 mPa.s (at 20°C)
 - Liquid temperature range -10°C to +50°C
 - Ambient temperature range -25°C to 55°C
 - Accuracy class 0.5
- (#1) For minimum measured quantities (V_{min}) less than 200 L, the scale interval of the calculator/indicator is 0.1 L; for deliveries greater than 200 L the scale interval is 1 L.
- (#2) Minimum pressure required for effective operation of the gas elimination device.

1.2 Components of Measuring System

(i) Supply tank

The supply tank, which may incorporate a detector for low liquid-level. A positive displacement, centrifugal or submersible turbine type pump may be used to provide flow through one or more flowmeters.

(ii) Pump

The pump is required to have sufficient capacity to allow flow rates at least three times the minimum flow rate specified for the flowmeter. If the pump is not for the exclusive use of the flowmeter, the pump shall be of sufficient capacity to ensure that flow rate through each meter is maintained above its respective specified

minimum flow rate and the pressure is maintained above the minimum backpressure recommended for each meter for all combinations of alternative uses of the pump.

A positive displacement type, centrifugal type, or submersible turbine type pump may be installed in a flooded suction configuration. Systems with positive displacement pumps are installed such that the pump stops when the liquid level in the supply tank is low. Systems which incorporate submersible turbine type pumps, may in addition include centrifugal type pumps fitted above the liquid level in the supply tank as supplementary pump.

(iii) Non-return Valve

A non-return valve between the pump and the meter, or an arrangement of the components and piping to keep the system (up to the transfer point) full of liquid at all times.

(iv) Gas Elimination Device

The pattern is fitted with SATAM Model EC42/FS24 Strainer gas Eliminator (Figure 2) or other compatible (#) strainer/air eliminator fitted upstream of the flowmeter to prevent vapour 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) Straightening Elements

The meter is factory fitted with an inbuilt flow straightening and conditioning element. Additionally, one may choose to install straightening elements of straight pipe of at least 10 pipe diameters in length upstream of the meter and straight pipe 5 pipe diameters in length downstream of the meter.

(vi) Measurement Transducer

The measurement transducer is a Daniel series 1200 turbine flowmeter (Figure 3) with dual pick-off coils producing an electrical output signal proportional to volume throughput. The pick-off signal is conditioned by a dual signal pre-amplifier to produce a square wave output signal.

(vii) Calculator/Indicator

The signal output from the measurement transducer is interfaced to an approved Contrec Model 1010A (Figure 4) as described in the documentation of approval NMI S313A or any other compatible (#) NMI-approved calculator/indicator.

(#) '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.

(viii) Transfer Device

(a) A transfer device, such as a Daniel model 788 (DVC) Digital valve controller automatically operated valve, or any other compatible positive shut-off component located downstream of the meter with no intermediate outlet, may be used define the start and finish of volume measured.

(b) Where the piping configuration downstream of the meter does not allow sufficient back pressure required by the gas elimination device, back pressure control can be provided by Daniel model 760 control valve (or

equivalent) back pressure control valve with a shut-off solenoid valve as an alternative to the unit described in (a) above.

- (c) Alternatively, a Daniel Model 770 control valve with optional shut-off solenoid valve as an alternative to the unit described in (a) above, is also acceptable. Such a device will require the vapour pressure reference connection to be located upstream of the flowmeter, typically in the head space of the gas eliminator.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Sealing Provision

Provision is made for the calibration adjustments to be sealed as described in the approval documentation for the indicator. This is not applicable as all adjustments are via the flow computer (K-Factor), double password protected (1 password for general access and one for NMI purposes).

1.5 Descriptive Markings and Notices

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

Pattern approval number	NMI No 5/6B/233
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 (#1)
Minimum pressure of the liquid, P_{min} kPa
Liquid temperature range	... to ... °C (#2)
Type of liquid for which the system is verified (#3)
Environmental class	class C
Accuracy class	0.5

(#1) Required for systems with flexible outlet pipework.

(#2) Required if temperature converted volume to 15°C is reported.

(#3) 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', or the pre-set of the controller is limited to deliveries equal to or greater than the minimum delivery specified for the flowmeter.

2. Description of Variant 1

approved on 08/07/24

With the Daniel model Series 1500 flowmeters as listed below in Table 2.

TABLE 2 – Daniel Series 1500

Diameter (mm)	Minimum Flow Rate (Q_{min}) (L/min)	Maximum Flow Rate (Q_{max}) (L/min)	Minimum Measured Quantity (V_{min}) (L)
80	265	2650	200
100	490	4900	200
150	1113	11130	1000
200	2252	22523	1000
250	3180	31800	2000
300	4770	47700	2000
400	6020	62600	10000
450	10600	106000	20000

Note: The flow rates must be at least a 10:1 ratio, maximum to minimum

2.1 Straightening Elements

The 1500 series flow meter has an optional flow conditioning element. One may choose to install straightening elements of

- 20 pipe diameters of straight pipe without a flow conditioning element upstream of the meter
- 10 pipe diameters of straight pipe with a flow conditioning element upstream of the meter
- 5 pipe diameters in length of straight pipe downstream of the meter.

TEST PROCEDURE No 5/6B/233

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.

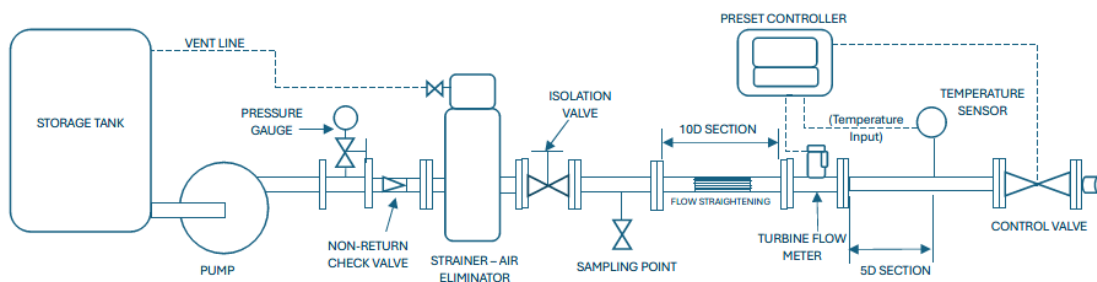
The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

Maximum Permissible Errors

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

FIGURE 5/6B/233 – 1

TYPICAL DANIEL TURBINE FLOW METERING SYSTEM



Schematic Drawing of a Daniel Series 1200 Liquid-Measuring System.

FIGURE 5/6B/233 – 2



SATAM Model EC42/FS24 Strainer Air Eliminator

FIGURE 5/6B/233 – 3



Daniel Series 1200 Liquid Turbine Meter

FIGURE 5/6B/227 – 4



Contrec Model 1010A Controller for Liquid-measuring Systems

FIGURE 5/6B/233 – 5



Daniel Series 1500 Liquid Turbine Meter – Variant 1

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