



Australian Government
Department of Industry,
Innovation and Science

National Measurement Institute

Certificate of Approval NMI 5/6B/202

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.

Fluid Power Products Model Stealth TS20AV Liquid-measuring System

submitted by Hurll Nu-Way Pty Ltd
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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 **1/11/21**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 4 approved – interim certificate issued	24/10/00
1	Pattern & variants 1 to 4 approved – certificate issued	13/12/00
2	Variant 5 approved – interim certificate issued	10/01/03
3	Variant 5 approved – certificate issued	11/02/03
4	Pattern & variant 1 to 5 approved – certificate re-issued	13/06/03
5	Pattern & variants 1 to 5 amended (1.1 Field of Operation & 1.4 Markings and Notices) – Notification of change issued	01/10/04

Document History (cont...)

6	Pattern & variants 1 to 5 amended and reviewed (Submittor name and address & 1. Description of pattern) – notification of change issued	31/08/06
7	Pattern amended (Submittor name and address) – notification of change issued	16/05/08
8	Pattern & variants 1 to 5 reviewed & updated – certificate issued	5/09/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI (or NSC) 5/6B/202' 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.

The values of the performance criteria (maximum number of scale intervals etc.) applicable to an instrument incorporating the pattern approved herein shall be within the limits specified herein and in any approval documentation for the other components.

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/202

1. Description of Pattern

**approved 24/10/00
re-issued 13/06/03**

A vehicle-mounted liquid-measuring system using a Fluid Power Products (FPP) model Stealth TS20AV (*) positive displacement meter (Figure 1 and Table 1) which is approved for accuracy class 0.5 for liquids other than water. The meter is adjusted to be correct for the liquid for which it is to be verified/certified.

May also be known as Tuthill Fluid Power Products instruments of the same model.

(*) Note that this is the basic meter number only – refer to clause **1.2 (v)** and Table 1.

1.1 Field of Operation

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

- Minimum measured quantity, V_{min} 100 L
- Maximum flow rate, Q_{max} 380 L/min
- Minimum flow rate, Q_{min} 38 L/min
- Maximum pressure of the liquid, P_{max} 1050 kPa
- Dynamic viscosity range at 20°C 0.4 to 20 mPa.s
- Maximum temperature of the liquid, T_{max} 50°C
- Minimum temperature of the liquid, T_{min} -10°C
- Maximum air temperature 55°C
- Minimum air temperature -25°C
- Accuracy class 0.5
- Type (nature) of liquids to be measured
e.g. petrol, distillate, biodiesel, biodiesel/distillate blend

1.2 Vehicle-mounted Liquid-measuring System (Figure 1)

(i) Tank

The supply tank may incorporate a device for detecting when the liquid level in the supply tank is low to stop liquid delivery and measurement.

(ii) Pump

The pump is fitted in a positive suction head (flooded suction) installation, i.e. below the liquid level in the supply tank.

A positive displacement type or centrifugal type pump may be used.

(iii) Non-return Valve

A non-return valve is fitted between the pump and the flowmeter to prevent reverse flow of the liquid or the components and pipework are installed to prevent reverse flow and to keep the flowmetering system full of liquid.

(iv) Gas Elimination Device

The gas elimination device consists of an FPP model AC2500 gas eliminator (Figure 2) with integral strainer and an FPP model VP2250 air-activated check valve with a rigid bleed line connected to one of two vent ports at the top of the gas eliminator (Figure 1). Both ports are fitted with reed valves. The gas elimination device is approved on the condition that the pump is operated under a positive suction head.

The gas elimination device prevents flow through the meter when air or gas is detected.

Once the air/gas is vented to the vapour space in the supply tank or to atmosphere, the system becomes full of liquid, and the gas elimination device will then allow liquid to flow through the meter.

The gas elimination device may be modified for use as a strainer only where the supply tank has a low level shut-off device to prevent gas entering the system. The air-activated check valve is not required if there is other means of preventing gas entering the system.

(v) Measurement Transducer

A measurement transducer is an FPP model Stealth TS20AV (*) positive displacement meter (Figure 2). [(*) Note that the full model number is TS20AV34BLCBMXA000 – refer to Table 1.]

The meter consists of two elliptical-shaped geared rotors that rotate within the measuring chamber displacing a fixed volume of liquid for each cycle. The rotors drive a shaft that connects via gearing to a calibrator, which drives the mechanical calculator/indicator. The calibrator has a calibration dial with a sensitivity of 0.03% that is used to adjust for any difference between the volume indicated by the calculator/ indicator and the actual volume delivered.

A thermowell is provided downstream of the meter, and provision is made for measuring the pressure at the meter.

(vi) Calculator/Indicator

The measurement transducer is fitted with a Veeder-Root 7886 or 7887 series resettable calculator/indicator (Figure 2). The model 7886 can display the metered volume to six figures and the accumulative totals to eight figures. The model 7887 can display the metered volume to five figures and the accumulative totals to eight figures.

Alternatively, the measurement transducer is fitted with a Veeder-Root 7890 series calculator/indicator with ticket printer, or with a Veeder-Root 7892 series calculator/ indicator with pre-set mechanism and ticket printer.

The optional Veeder-Root pre-set mechanism (Figure 2) is fitted between the calculator/ indicator and the meter. The pre-set mechanism is mechanically linked to an FPP model AC2000 two-stage pre-set operated control valve fitted immediately downstream of the meter. The pre-set counter is only approved for facilitating the delivery and is marked 'PRE-SET INDICATION NOT IN USE FOR TRADE'.

The calculator/indicator may be replaced with any other NMI-approved compatible calculator/indicator that can be fitted to the meter output shaft without modifying meter components.

Note: Approved printers are fitted with the internal right-hand wheel for printing the unit of measurement.

(vii) Transfer Device

The transfer device is in the form of either a shut-off valve, a nozzle or a dry disconnect coupling at the end of the delivery pipework or flexible hose and/or hose reel. The shut-off valve may be operated either manually or automatically. An optional flow control valve may be fitted between the transfer point and the meter (Figure 1).

If a hose is used, the nozzle has an anti-drain valve installed either in the nozzle or immediately before it, and having a retaining pressure of not less than 55 kPa; the nozzle is the transfer device.

The pipework between the gas elimination device and the transfer point shall be kept full of liquid during the measurement and shutdown periods.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Descriptive Markings and Notices

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

Pattern approval mark	NSC No 5/6B/202
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, P_{max} kPa
Environmental class	class C
Cyclic Volume L/rev
Type of liquid for which the system is verified (*)

- (*) This may be located separately, e.g. on a metal tag sealed to the instrument. The type of liquid shall be in a form such as 'Petrol', 'Distillate', 'Biodiesel', 'biodiesel/distillate blend', or 'P', 'D' or 'B'.

Notices as specified elsewhere in this Technical Schedule.

The minimum measured quantity (V_{min}) is clearly visible on the indicating device, e.g. 'Minimum Delivery 100 L'.

1.5 Sealing Provision

Provision is made for sealing the following components:

- The covers of the meter housing;
- The calibrating mechanism; and
- The indicating mechanism and pre-set mechanism (if fitted).

2. Description of Variant 1

**approved 24/10/00
re-issued 13/06/03**

Using certain other Fluid Power Products (FPP) Stealth meters as listed in Table 1.

TABLE 1

Meter Model (*)	Flow Rate (L/min)		Minimum Measured Quantity (L)	Pre-set Valve Model (#)
	Q_{min}	Q_{max}	V_{min}	
TS20	38	380	100	VP2000
TS2H (or TS25)	57	570	200	VP2000
TS30	76	760	200	VP3000

(*) Note that the meter models listed are basic model numbers only – the full model numbers may have a variety of additional alphanumeric characters, e.g. TS20AV34BLCBMXA000, where:

- ‘TS’ designates ‘Tuthill Stealth’ series.
- ‘20’ designates nominal size, e.g. 20 = 2 inch (50 mm).
- ‘A’ designates case material; various alpha characters e.g. A = anodised aluminium, C = stainless steel.
- ‘V34’ designates assembly configuration; e.g. V = Veeder-Root calculator/indicator.
- ‘B’ designates connection; e.g. B = BSP companion flanges.
- ‘L’ designates unit of measurement; L = litre.
- ‘C’ designates pressure rating; C = 1050 kPa.
- ‘BM’ designates gears and bearings, e.g. B = ryton gears/carbon bearings, and M = mechanical drive.
- ‘X’ designates signal sensor (if any), e.g. X = none.
- ‘A’ designates seals, e.g. A = viton.
- ‘000’ designates special options.

(#) Model of the pre-set operated control valve used, when the meter is fitted with a pre-setting facility

3. Description of Variant 2

**approved 24/10/00
re-issued 13/06/03**

With an optional gas elimination device. The model TS20AV and TS25AV flowmeters fitted with an FPP model AE2000 gas eliminator and an FPP model AC10000 large quadruple capacity strainer assembly upstream of the meter, replacing the downstream model VP2250 air-activated check valve.

4. Description of Variant 3

**approved 24/10/00
re-issued 13/06/03**

A drum-filling liquid-measuring system which is similar to the pattern, including using the Fluid Power Products (FPP) model Stealth TS20AV positive displacement meter, except for the following:

- The transfer device is in the form of an outlet control valve operated automatically by the pre-set mechanism. The pre-set mechanism also incorporates a mechanism to manually stop the delivery.

- The pre-set mechanism is set and calibrated for trade use for a fixed batch delivery, in which case the instrument is marked PRE-SET FOR '# LITRES BATCHES, or similar wording (where '#' equals a pre-set delivery of not less than 100 L).

The pre-set mechanism of this variant shall be sealed to prevent unauthorised adjustment or dismantling.

The system is arranged such that the meter operates at a constant flow rate ($\pm 5\%$ of nominal) within the maximum and minimum flow rate range specified in Table 1.

The outlet is either a drum-filling spear or a hose with a nozzle. If a spear is used, it is arranged to fully drain after each delivery so that the control valve is the transfer device. If a hose is used, the nozzle has an anti-drain valve installed either in the nozzle or immediately before it, and having a retaining pressure of not less than 55 kPa; the nozzle is the transfer device.

5. Description of Variant 4

**approved 24/10/00
re-issued 13/06/03**

As a vehicle tank loading liquid-measuring system which is similar to the pattern except the following:

The transfer device is one of the following:

- (a) Top-loading arrangement – the highest point of the pipework forms a weir at a fixed level from which the delivery pipe drains to the outlet for all configurations of the hose or loading arm whilst in operation. A syphon breaker is installed to ensure complete draining of the pipework downstream of the weir.

Alternatively, an anti-drain valve which retains a pressure of not less than 55 kPa may be installed at the delivery point of the pipework or hose; or

- (b) Bottom-loading arrangement – a dry disconnect coupling located at the delivery point of the pipework or hose.

6. Description of Variant 5

**approved 10/01/03
re-issued 13/06/03**

For use with liquids having a dynamic viscosity range between 20 mPa.s and 1000 Pa.s at 20°C.

In utilising this variant it is the responsibility of the submitter to ensure that equipment supplied as part of the system is suitable for the application and is constructed in a manner that will facilitate performance that is within the allowable maximum permissible errors for the system.

Other equipment may be included as part of the system for cleaning, product decontamination and general maintenance; this additional equipment must not introduce any features which may affect the accuracy of the system or facilitate fraud.

For this variant the gas elimination device described for the pattern may be modified for use as a strainer only.

TEST PROCEDURE

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

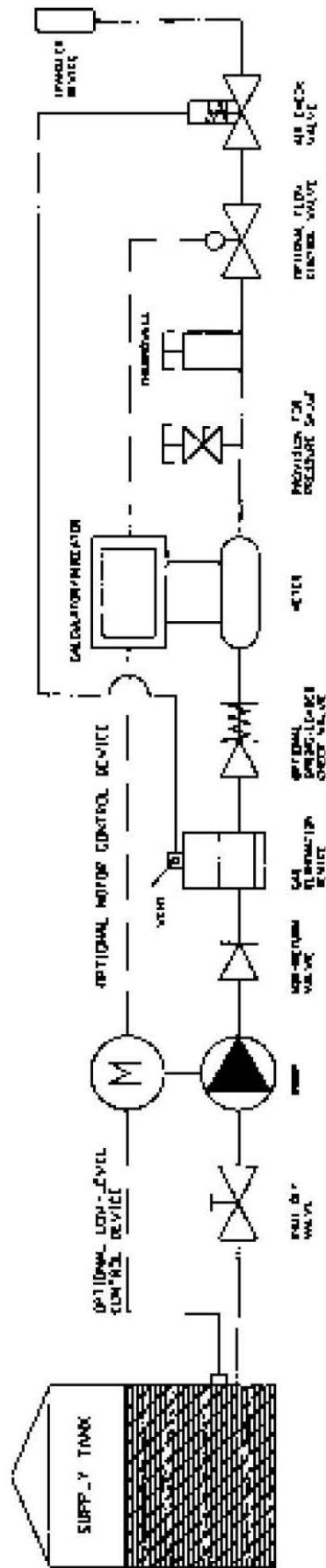
The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

Maximum Permissible Errors

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

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*.

FIGURE 5/6B/202 - 1



Typical Vehicle-mounted Liquid-measuring System

FIGURE 5/6B/202 - 2



Fluid Power Products Model Stealth TS20AV Meter
With Veeder-Root Calculator/Indicator and Veeder-Root Pre-set Mechanism

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