

5/6B/82
25 May 2000



National Standards Commission

12 Lyonpark Road, North Ryde NSW

Cancellation Certificate of Approval No 5/6B/82

This is to certify that the approval for use for trade granted in respect of the

TEG Model 1000 Flowmetering System

submitted by Environmental Systems Pty Ltd
9 Packard Avenue
Castle Hill NSW 2154

has been cancelled in respect of new instruments as from 1 June 2000.

Instruments which were verified/certified before that date may, with the concurrence of the relevant verifying authority, be submitted for reverification.

Signed by a person authorised under Regulation 63 of the National Measurement Regulations 1999 to exercise the powers and functions of the Commission under this Regulation.

National Standards Commission



Certificate of Approval

No 5/6B/82

Issued under Regulation 9
of the
National Measurement (Patterns of Measuring Instruments) Regulations

This is to certify that an approval for use for trade has been granted in respect of the

TEG Model 1000 Flowmetering System

submitted by Environmental Systems Pty Ltd
9 Packard Avenue
Castle Hill NSW 2154.

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.

CONDITIONS OF APPROVAL

This approval is subject to review on or after 1 April 1996.
This approval expires in respect of new instruments on 1 April 1997.

Instruments purporting to comply with this approval shall be marked NSC No 5/6B/82 and only by persons authorised by the submittor.

The Commission reserves the right to examine any instrument or component of an instrument purporting to comply with this approval.

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 Commission 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 the Commission's Document 106.

DESCRIPTIVE ADVICE

Pattern: provisionally approved 6 March 1990 - approved 13 December 1991

- A TEG model 1000 flowmetering system for use at maximum and minimum flow rates of 1100 L/min and 850 L/min respectively.

Technical Schedule No 5/6B/82 describes the pattern.

Variant: approved 1 November 1994

1. A model ES500 flowmetering system for use at maximum and minimum flow rates of 1000 L/min and 100 L/min respectively.

Technical Schedule No 5/6B/82 Variation No 1 describes variant 1.

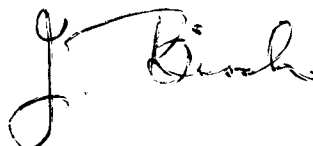
FILING ADVICE

Certificate of Approval No 5/6B/82 dated 20 June 1990 is superseded by this Certificate and may be destroyed. The Test Procedure (and Figure 1) included as part of Technical Schedule No 5/6B/82 both dated 20 June 1990 should be replaced by the Test Procedure (and Figure 1) attached herein.

The documentation for this approval now comprises:

Certificate of Approval No 5/6B/82 dated 19 December 1995
Technical Schedule No 5/6B/82 dated 20 June 1990
Technical Schedule No 5/6B/82 Variation No 1 dated 19 December 1995
(incl. Test Procedure)
Figure 1 dated 19 December 1995
Figure 2 dated 20 June 1990
Figure 3 dated 19 December 1995

Signed and sealed by a person authorised under Regulation 9 of the National Measurement (Patterns of Measuring Instruments) Regulations to exercise the powers and functions of the Commission under this Regulation.





National Standards Commission

TECHNICAL SCHEDULE No 5/6B/82

Pattern: TEG Model 1000 Flowmetering System.

Submittor: The Environmental Group Pty Ltd
2/9 Packard Avenue
Castle Hill NSW 2154.

1. Description of Pattern

A TEG model 1000 flowmetering system for use with liquids having a kinematic viscosity range between 0.4 and 5.0 mm²/s at maximum and minimum flow rates of 1100 L/min and 850 L/min respectively.

The pattern is installed in a pipeline in a manner similar to that shown in Figure 1. The system includes 2 flowmeters and an indicator to display the difference in flow between the meters.

1.1 Flowmeters

The supply and return lines are each fitted with a Smith turbine flowmeter (as described in the documentation of NSC approval No 5/6B/74).

1.2 Indicator

The model TEGC digital Indicator (Figure 2) converts the flow from the meters to volume, and has three displays; only the DIFFERENCE display need be visible for normal operation. The DIFFERENCE display shows the arithmetic difference between the SUPPLY and RETURN displays. All displays have 6 digits and read in decalitres.

The input lines from the pulse output of the meters are protected with isolation devices.

1.2.1 Specifications

The operating specifications of the indicator are as follows:

Pulses/min	300 to 300 000
Frequency	5 to 5000 Hz
Input maximum	50 V
Input minimum	1.4 V

1.2.2 Totalisation

Either the running total or the accumulated total may be displayed by selecting the TOTAL or ACCUM. TOTAL on the front panel. An LED will light to indicate which of the two totals has been selected.

1.2.3 Temperature Conversion

The indicator is fitted with a temperature conversion facility for use with liquids having a temperature range of 0°C to +45°C and for a range of densities from 700 kg/m³ to 900 kg/m³, at 15°C.

1.2.4 Linearisation

A multipoint, variable flow rate linearisation facility is available to linearise the calibration curve of the meter over a total of 8 points all of which are pre-settable within the flow rate range of the meters. The maximum effect at each point is $\pm 0.995\%$.

1.2.5 Display Check

A display check is initiated whenever power is applied to the indicator.

1.3 Markings

- (a) The meters shall be marked "NSC No P5/6B/82" in addition to any markings specified in the approval documents for the meters.
- (b) The digital indicator shall be marked with the following data, together in the one location:

Manufacturer's name or mark	
Model number	
Serial number	
NSC approval number	P5/6B/82
Maximum flow rate L/min
Minimum flow rate L/min
Type of liquid for which the meter is verified	
Bulb (liquid) temperature range	min..°C max..°C
Density for which conversion device is set kg/m ³
Type and density of liquid being metered kg/m ³
Operating (air) temperature range	- 10°C to +45°C
Reference temperature	15°C

In addition, if the above markings are not located on the indicator reading face, it shall be marked "Reference temperature 15°C".

1.4 Verification Provision

Provision is made for a verification mark to be applied.

TEST PROCEDURE

Tests are to be conducted in accordance with the Inspector's Handbook for all aspects of performance other than calibration of the meters/indicators; for this operation the test procedure below shall be followed.

- NOTE:**
- (I) TO AVOID ERRORS CAUSED BY VAPORISATION, THE TEST SYSTEM MUST BE CLOSED.
 - (II) These tests can only be conducted with the assistance of an authorised technician.
 - (III) Set the SUPPLY and RETURN meters to display in litres.

Test Method

- (a) Connect the proving device to the outlet ports provided on the pipework downstream of the RETURN meter.
- (b) Close the valves to isolate the pattern for testing purposes and open the valve on the bypass loop.
- (c) Turn off the temperature conversion facility.
- (d) Set the flow rate to give the approximate minimum flow rate using valves upstream of the SUPPLY meter.
- (e) Take a minimum of 3 readings of a delivered quantity equivalent to 10 times the minimum flow rate.
- (f) Check that the calibration of the SUPPLY meter is within the prescribed maximum permissible error of $\pm 0.15\%$.
- (g) Check that the difference between the readings on the SUPPLY and RETURN meters is not greater than 1 litre.
- (h) Repeat steps (f) and (g) at the maximum flow rate.
- (i) Set the flow rate to the normal operating flow rate and take a minimum of 3 readings of a delivered quantity equivalent to 20 times the flow rate.

The difference in readings between the meters should not be greater than 1 litre.
- (j) Repeat step (i) with the temperature conversion facility switched on. The difference between the average from step (i) and that from this step should be less than $\pm 0.2\%$.

The difference in readings between the meters should not be greater than 1 litre.
- (k) Reset the instrument to normal operation.



National Standards Commission

TECHNICAL SCHEDULE No 5/6B/82

VARIATION No 1

Pattern: TEG Model 1000 Flowmetering System.

Submittor: Environmental Systems Pty Ltd
9 Packard Avenue
Castle Hill NSW 2154.

1. Description of Variants

1.1 Variant 1

With a TEG model ES500 flowmeter indicator instead of the indicator of the pattern. The ES500 indicator (Figure 3) converts the pulses from the meters to volume. The single display is set to show the PRODUCT RECOVERY (volume converted for temperature), i.e. the arithmetic difference in volume between the supply and return meters. Other information can be displayed by scrolling through the various menu options.

The ES500 indicator incorporates a multi-point linearisation correction facility and an electronic volume conversion for temperature facility.

The signal lines carrying the pulse output of the meters to the indicator may be protected with isolation devices.

1.1.1 Specifications

The operating specifications of the indicator are as follows:

Frequency	0 to 4000 Hz
Input maximum	28 V DC
Input minimum	21 V DC

1.1.2 Volume Conversion For Temperature Facility

An electronic volume conversion for temperature facility is used to convert the measured volume to volume at 15°C of generalised petroleum products of density between 654 kg/m³ and 800 kg/m³, at liquid temperatures between 0°C and 50°C. Volume conversion is based on Table 54B (generalised products) of the ASTM-IP *Petroleum Measurement Tables*.

The converted volume, temperature and density setting may be viewed by pressing the DISPLAY button.

1.1.3 Linearisation

A linearisation correction facility is incorporated which may be used to linearise the meter calibration curve as a function of flow rate.

Up to 10 frequencies and K-factors can be programmed through the calibration function. Linear interpolation is used between the entered K-factors, up to the maximum input frequency of 4000 Hz.

1.1.4 Markings

Instruments are marked with the following minimum data, together in the one location:

Manufacturer's name or mark	
Meter model	
Serial number	
NSC approval number	5/6B/82
Maximum flow rate L/min
Minimum flow rate L/min
Normal flow rate L/min #
Type of liquid for which the meter is verified
Liquid temperature range	0°C to 50°C
Reference temperature	15°C

This may be located separately from the other markings.

1.1.5 Verification/Certification and Sealing Provision

Provision is made for a verification mark to be applied.

Access to the instrument's calibration mode is via a sealed switch.

1.2 Variant 2

For use over other flow rate ranges using any Commission-approved Smith turbine flowmeter.

TEST PROCEDURE

This Test Procedure replaces that included as part of Technical Schedule No 5/6B/82 dated 20 June 1990.

Tests are to be conducted in accordance with the Inspector's Handbook and the following procedure and maximum permissible errors.

- NOTES:**
- . To calibrate the meters, a master meter is preferred to provide a closed system and so avoid errors caused by vaporisation.
 - . These tests can only be conducted with the assistance of an authorised technician.
 - . Set the SUPPLY and RETURN meters to display in litres.

Test Method (refer Figure 1)

- (a) Connect the master meter to the outlet ports provided on the pipework downstream of the RETURN meter.
- (b) Close the valves to isolate the meters from the vapour recovery unit and open the valve on the bypass loop.
- (c) **Using the unconverted volume indications**, verify the performance of the RETURN meter against the master meter, by carrying out **not less than three test runs at the normal flow rate** of the system.

The maximum permissible error is $\pm 0.15\%$.

The test quantity shall be not less than (i) 1 minute's flow at the maximum flow rate, and (ii) 2000 times the scale interval of the master meter **or meter under test**.

- (d) Remove the master meter from the system but continue with the vapour recovery unit isolated from the meters.
- (e) Insert reference thermometers in the thermometer wells provided. Check that the density at 15°C of the liquid being measured is within $\pm 5 \text{ kg/m}^3$ of the density setting as shown on the indicator.

Circulate liquid through the SUPPLY and RETURN meters and carry out at least three test runs **for at least 10 minutes** at the normal flow rate and record the following for both meters:

- . unconverted volume;
- . converted volume;

- temperature of system; and
- temperature of reference thermometers.

Check the following:

- For each meter, the difference between the converted volume and the unconverted volume times the volume conversion factor is 0.2% or less. The volume conversion factor is obtained from the appropriate ASTM-IP Petroleum Measurement Tables for the density setting and the temperature recorded by the reference thermometer.
 - The difference between the readings of the converted volume for each meter is not greater than **0.1% of the quantity metered**.
 - The difference in the temperature indicated by the reference thermometer and the system for each meter is 0.5°C or less.
- (f) Reset the system to normal operation.

National Standards Commission



Notification of Change Certificate of Approval No 5/6B/82 Change No 1

The following changes are made to the approval documentation for the

TEG Model 1000 Flowmetering System

submitted by Environmental Systems Pty Ltd
 9 Packard Avenue
 Castle Hill NSW 2154.

- A. In Certificate of Approval No 5/6B/82 dated 19 December 1995;
1. The Condition of Approval referring to the review of the approval should be amended to read:
- This approval becomes subject to review on 1 April 1996, and then every 5 years thereafter.
2. The Condition of Approval referring to the expiry of the approval should be deleted.
- B. In Technical Schedule No 5/6B/82 Variation No 1 dated 19 December 1995, several typographical errors on the top of page 4 should be amended as follows:
- (i) "5/6B/85", in two places, should be changed to read "5/6B/82"; and
- (ii) "20/8/93" should be changed to read "19 December 1995".

Signed and sealed by a person authorised under Regulation 9 of the National Measurement (Patterns of Measuring Instruments) Regulations to exercise the powers and functions of the Commission under this Regulation.

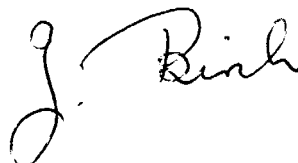
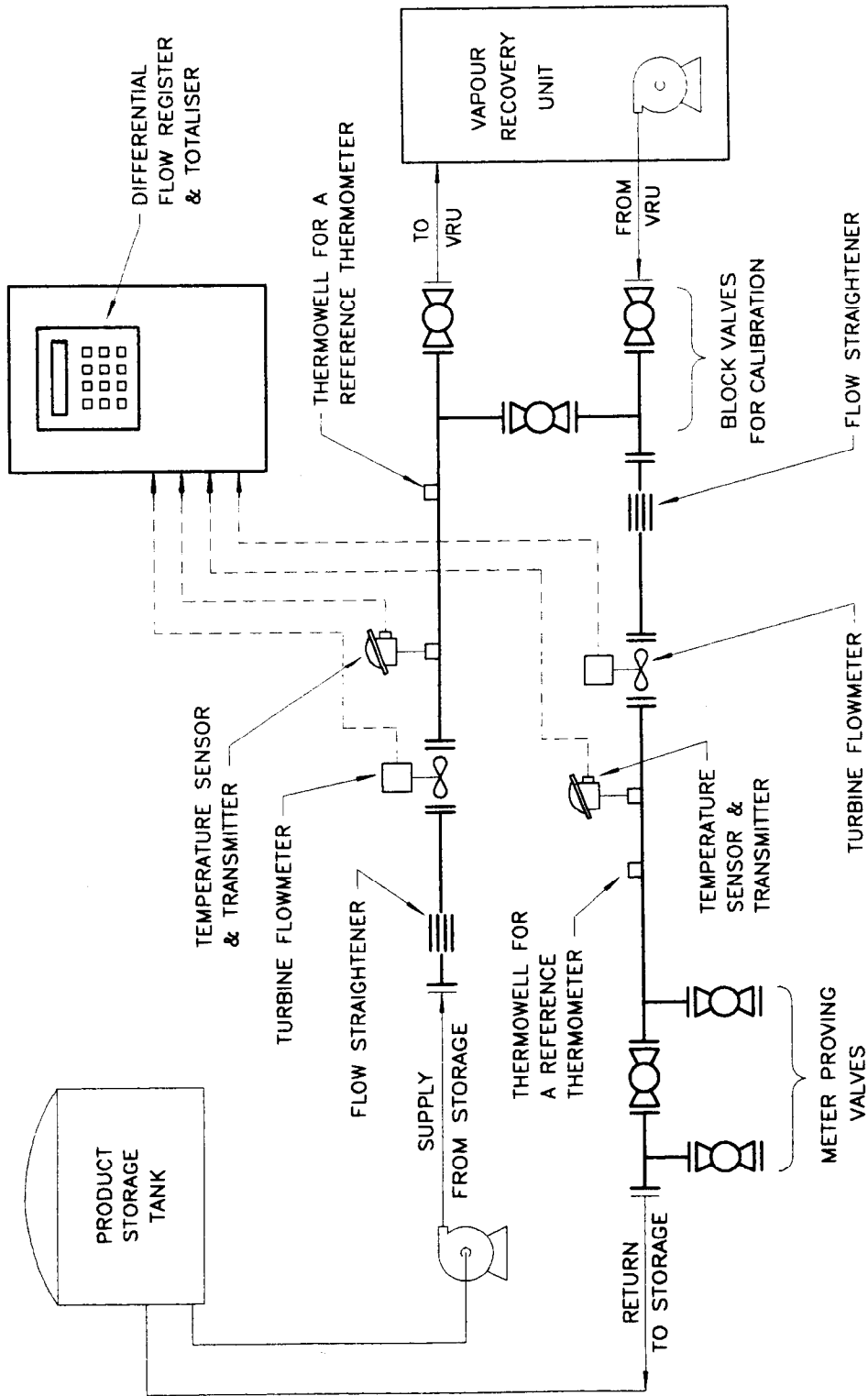


FIGURE 5/6B/82 - 1



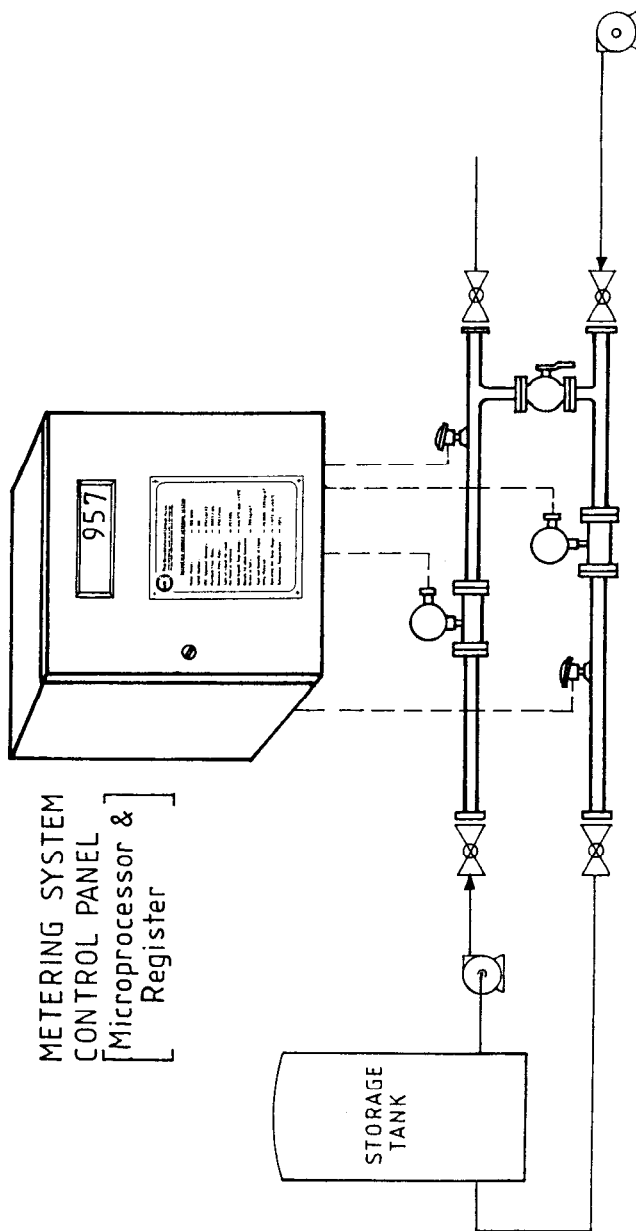
Typical TEG Flowmetering System

FIGURE 5/6B/82 - 3



TEG Model ES500 Indicator

Figure 5/68/82 - 1



Typical TEG 1000 Flowmetering System

