5/6B/21A
22 December 2004

Australian Government

National Measurement Institute

12 Lyonpark Road, North Ryde NSW 2113

Cancellation

Certificate of

Approval No 5/6B/21A

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

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

Smith Model LT-11 Bulk Flowmetering System

submitted by Diamond Key International Pty Limited
110 Henderson Road
Rowville VIC 3178

has been cancelled in respect of new instruments as from 1 April 2005.

Signed by a person authorised by the Chief Metrologist to exercise his powers under Regulation 60 of the National Measurement Regulations 1999.

National Standards Commission

Certificate of Approval

No 5/6B/21A

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

Smith Model LT-11 Bulk Flowmetering System

submitted by Email Electronics
88-94 Canterbury Road
Kilsyth VIC 3137.

This Certificate is issued upon completion of reviews of NSC approvals Nos 5/6B/21, 5/6B/26, 5/6B/27, 5/6B/33 and 5/6D/22.

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 1/10/97.
This approval expires in respect of new instruments on 1/10/98.

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Instruments purporting to comply with this approval shall be marked NSC No 5/6B/21A 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 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.

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

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificate No S1/0/A.

DESCRIPTIVE ADVICE

Pattern: approved 28/9/92

- A bulk flowmetering system using a Smith model LT-11 flowmeter which is approved for use with liquids having a kinematic viscosity between 0.5 and 12.5 mm^2/s.

Variants: approved 28/9/92

1. As a loading-rack flowmetering system.
2. As a modular flowmetering system.
3. As a drum-filling flowmetering system.
4. As a bulk flowmetering system using certain other Smith flowmeters.
5. For use with liquids having a kinematic viscosity between 12.5 and 1450 mm^2/s.
6. For use with bituminous products having a kinematic viscosity between 5 and 25 mm^2/s.

Technical Schedule No 5/6B/21A describes the pattern and variants 1 to 6.

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FILING ADVICE

The documentation for this approval comprises:

Certificate of Approval No 5/6B/21A dated 31/1/94
Technical Schedule No 5/6B/21A dated 31/1/94 (incl. Table 1 and Test Procedure)
Figures 1 to 6 dated 31/1/94

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/21A

Pattern: Smith Model LT-11 Bulk Flowmetering System.

Submittor: Email Electronics
88-94 Canterbury Road
Kilsyth Victoria 3137.

1. Description of Pattern

A bulk flowmetering system using a Smith model LT-11 flowmeter which is approved for use with liquids having a kinematic viscosity between 0.5 and 12.5 mm^2/s.

The system is approved for use for a flow rate range of 37 L/min to 300 L/min for normal operation, but may be used for short periods up to an extended maximum flow rate of 375 L/min.

The minimum quantity is 100 litres.

1.1 Pipeline Flowmetering System (Figure 1)

(i) Tank

A supply tank.

(ii) Pump

A pump of either positive displacement or centrifugal type - in the latter case the pump is mounted lower than the minimum height of the liquid in the supply tank. The supply pipe from the tank has a continuous fall to the pump.

If the pump is not for the exclusive use of the flowmeter the flow rate through the meter must stay within the appropriate flow rate range for all combinations of alternative uses of the 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 full of liquid at all times.

(iv) Gas Purger/Strainer

A gas purger/strainer assembly fitted as close as practical to the meter inlet (Figure 2). The gas purger is approved on the condition that the pump is operated under a positive suction head.

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The gas purger/strainer assembly may be modified for use as a strainer only where the tank has automatic alarming of low-liquid level, or has a float-operated shut-off valve in the pump supply, or has other means to prevent gas entering the system.

(v) Meter

A Smith model LT-11 flowmeter (Figure 2). May also be known as a model T-11. Provision shall be made for a pressure gauge to be connected downstream of the meter.

(vi) Indicating System

Any of the following assemblies:

(a) A Veeder-Root 1624 series or 7887 series zero start indicator with or without (d).

(b) A Veeder-Root 7085 series or 7890 series zero-start indicator (Figure 2) with ticket printer with or without (d).

(c) A Smith model 343-30 or Veeder-Root 7889 series preset counter (Figure 2) with a Smith preset-counter-operated outlet control valve; a pressure relief pipe may be fitted between the valve and the gas purger/strainer. The preset counter is marked PRESET NOT IN USE FOR TRADE.

(d) A Commission-approved Smith model ATC or model ATG mechanical volume conversion for temperature device (as described in the documentation of NSC approvals Nos S146A and S147A, respectively).

(e) A rigid extension drive from the meter to the indicator and ticket printer.

(f) A Smith model SS1 flow controller (NSC No S190).

(g) Any compatible Commission-approved pulse generator, electronic bulk flowmeter controller/indicator and flow control valve.

NOTE: Where systems include a pulse generator and electronic indicator, the pulse generator shall be driven directly from the output shaft of the meter; it shall not be driven via a mechanical indicator nor via reduction gear trains.

The use of a right-angled drive would be considered as direct as long as the drive consists of two bevel gears with a 1:1 ratio and provided the right-angled drive is before the drive to any mechanical indicator.

Where the pulse generator is not driven directly, any electronic indicator connected to it shall be marked NOT IN USE FOR TRADE.

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(vii) **Transfer Device**

A transfer device in the form of a positive shut-off component such as a manually or automatically-operated control valve located downstream of the meter with no intermediate outlet.

1.2 Markings

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

Manufacturer's name or mark	
Meter model	
Serial number	
NSC approval number	5/6B/21A
Maximum flow rate	..... L/min
Minimum flow rate	..... L/min
Minimum quantity	 L
Type of liquid for which the meter is verified	..... #
Maximum operating pressure	..... kPa

May be located separately, e.g. on a metal tag sealed to the instrument.

In addition, preset counters (other than on drum-filling flowmeters complying with clause **2.3 Variant 3**) shall be marked PRESET NOT IN USE FOR TRADE.

1.3 Sealing and Verification/Certification Provision

Provision is made for sealing the calibration device of the meter. Provision is also made for a verification/certification mark to be applied.

2. Description of Variants

2.1 Variant 1

As a loading-rack flowmetering system (Figure 3) which is similar to the pipeline system except that the control valve is installed at or upstream of the transfer device, which is one of the following:

(i) 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

(ii) Bottom-loading arrangement - a dry-break coupling located at the delivery point of the pipework or hose.

2.2 Variant 2

As a modular flowmetering system (Figure 4) which is similar to the pipeline and loading-rack systems, except that it is a module of metering components in its own assembly rather than built into another structure. It may be portable, including being vehicle-mounted.

The system consists of a gas purger/strainer, a meter and a transfer device. It may contain the pump, together with a pressure control valve (if necessary), and a hose reel; in the latter case, the transfer device is in the form of either a nozzle or dry-break coupling at the end of a flexible hose.

The pump is located lower than the minimum height of the liquid in the supply tank. A non-return valve is located between the pump and the meter, or the components and piping are arranged to keep the system full of liquid at all times.

Any nozzle used shall have an integral outlet control valve. If fitted with an integral anti-drain valve, the valve shall be immediately before the outlet control valve. A separate anti-drain valve may be fitted to the nozzle end of the hose if an integral anti-drain valve is not part of the nozzle. The anti-drain valve retaining pressure shall be not less than 55 kPa.

2.3 Variant 3

As a drum-filling flowmetering system (Figure 5) which is similar to the pipeline and loading-rack systems except for the following:

(i) The system uses a Smith model LT-11H flowmeter (Figure 6) which is approved for use at maximum and minimum flow rates of 220 L/min and 160 L/min respectively. The minimum quantity is 50 litres.

(ii) The meter is fitted with a Smith model 502 counter and a Smith outlet control valve with integral anti-drain valve. The valve may be closed manually or by the 502 counter. A pressure relief pipe is fitted between the valve and the gas purger/strainer.

The indicator is approved to repeat deliveries of 60, 200 or 205 litres, and is marked PRESET FOR '#' LITRES (where '#' equals one of the approved preset quantities). Unlike the pattern, the preset counter of this variant need NOT be marked PRESET NOT IN USE FOR TRADE.

(iii) The system is arranged such that the meter operates at a constant flow rate (±5% of nominal) within the maximum and minimum flow rate range.

(iv) The outlet is either a drum-filling spear or a hose. 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, it is fitted with a model F13931 nozzle which 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.

2.4 Variant 4

A bulk flowmetering system using any Smith flowmeter listed below. These systems are not approved for drum-filling.

TABLE 1

Meter Model	Flow Rate L/min Maximum (#) Minimum	Minimum Quantity L
LT-11	300 (375) 37	100
LT-20	750 (900) 100	200
LT-40	1500 (1900) 190	300
SC-13	475 (570) 57	100
ST-40	400 (n/a) 40	50
ST-75	1000 (n/a) 100	100
ST-160	1600 (n/a) 160	200
I-75	285 (n/a) 57	100
I-150	570 (n/a) 114	200

NOTE: Meters with the prefixes LT may drop the L prefix and/or have suffixes such as H,P,R,T,V,X or Z, as in T-11 or LT-11Z.

(#) The value given in brackets ( ) for maximum flow rate is the extended maximum flow rate value for use over short periods only.

2.5 Variant 5

For use with liquids having a kinematic viscosity between 12.5 and 1450 mm^2/s.

2.6 Variant 6

For use with bituminous products at temperatures between 170 and 210°C, having a kinematic viscosity between 5 and 25 mm^2/s. Instruments are used with a Commission-approved Smith model ATC or model ATG mechanical volume conversion for temperature device and any of the mechanical indicators as described for the pattern; alternatively, any compatible Commission-approved pulse generator and electronic bulk flowmeter controller/indicator. (NOTE: The pulse generator and the volume conversion facility of the indicator MUST be Commission-approved for the temperature range specified above.)

TEST PROCEDURE

Instruments should be tested in accordance with the Inspector's Handbook using the product with which they will be used and which is marked on the data plate. Tests should be conducted in conjunction with any tests specified in the approval documentation for any indicator and/or conversion device, etc. used.

Maximum Permissible Errors at Verification/Certification

The maximum permissible error applied during a verification test from normal flow rate to the minimum flow rate specified in the Certificate of Approval or Technical Schedule is ±0.3%.

Where an instrument is fitted with a device to convert the registered volume to volume at reference conditions, the maximum permissible error specified above is increased by 0.2%. Reference conditions for petroleum liquids are specified in Australian Standard 2649 - 1983, *Petroleum Liquids and Gases - Measurement - Standard Reference Conditions.*

1. Meter Tests for Bitumen, Lube Oil, or other products of similar viscosity

The following is the recommended test procedure for the verification of meters used for measuring bituminous products, and requires a verified weighbridge.

Notes:

(a) The density of the metered product may vary due to the amount of additives introduced and a density value (mass/unit volume) at 15°C of the product being used for test should be obtained before testing commences. Conversion factors for registered volume to volume at 15°C are available from the Commission.

(b) The procedure does not take into account the closeness of a suitable weighbridge; should the weighbridge not be in the vicinity of the meter or filling point, then either an allowance must be made for fuel used or, preferably, the tanker's fuel tanks should be topped up before each weighing, either at the terminal or near the weighbridge. This provides a constant value for the tare weight of the tanker at all weighings.

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(c) The method of measurement indicated above introduces additional uncertainties which may be of a similar order to the **maximum permissible error for repeatability** when the scale interval is **approximately** equal to a weight equivalent to more than 0.1% of the test volume delivered. These uncertainties need to be considered when assessing the performance of the meter under test.

(d) The weighbridge shall have been calibrated not more than six weeks before testing the meter, with particular attention paid to points in the loading curve approximately equal to the tare of the tanker, tare plus one test delivery from the meter and tare plus two test deliveries. A scale interval should be used which is as small as possible, preferably equal to a weight equivalent to less than 0.1% of the test volume of product delivered.

Test Method

(i) Determine the tare weight of the tanker.

(ii) Make a delivery into the tanker of approximately 40% of its maximum capacity at its nominal flow rate, noting:

- Average product temperature (t);
- Average flow rate;
- Converted registered volume at completion of the delivery (Vr_c); and
- Un-converted registered volume at completion of the delivery (Vr_u).

(iii) Weigh the tanker and record the gross weight. The weight of the volume delivered is equal to the net weight. The volume at 15°C (Vd_{15}) is found from the net weight using Table 56 of the ASTM-IP Tables and the density at 15°C.

The volume delivered (Vd_t) at the product temperature (t) is found from the volume at 15°C by using volume conversion factors available from the Commission.

(iv) Repeat steps (ii) and (iii) and, where the flow rate varies in use by more than ±10% of nominal, repeat twice at the maximum and minimum flow rates.

(v) The error for the converted volume (e_c) is found as follows:

$$e_c = \frac{Vr_c - Vd_{15}}{Vd_{15}} \times 100\%$$

The error for the unconverted volume (e_u) is found as follows:

$$e_u = \frac{Vr_u - Vd_t}{Vd_t} \times 100\%$$

National Standards Commission

Notification of Change

Certificate of Approval No 5/6B/21A

Change No 1

The following changes are made to the approval documentation for the

Smith Model LT-11 Bulk Flowmetering System

submitted by Email Electronics
88-94 Canterbury Road
Kilsyth VIC 3137.

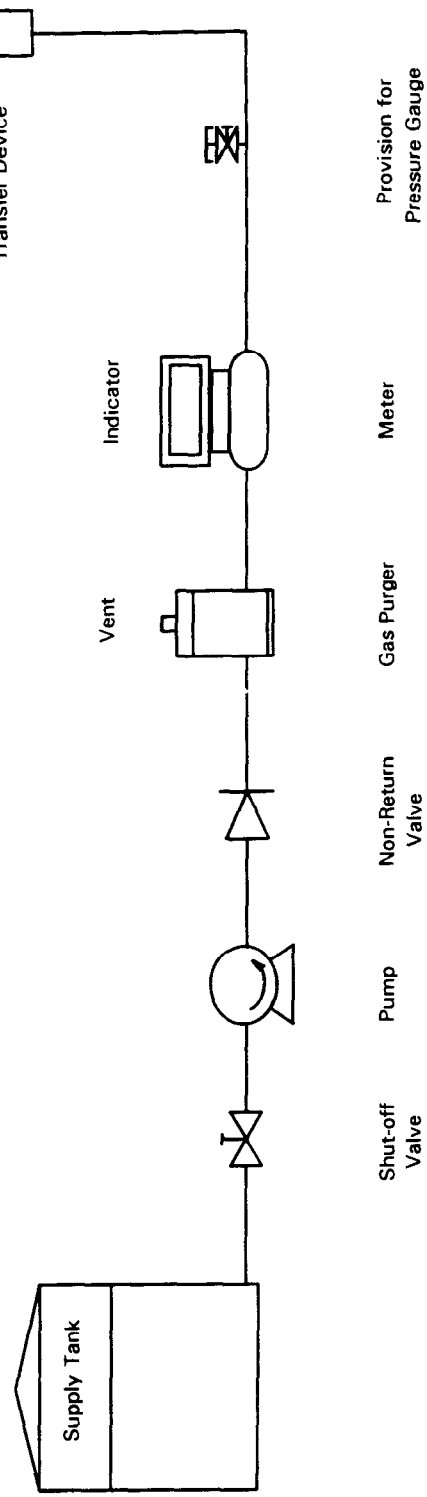
(a) In Certificate of Approval No 5/6B/21A and its Technical Schedule, both dated 31 January 1994, all references to the submittor should be amended to read;

Diamond Key International Pty Limited
110 Henderson Road
Rowville VIC 3178.

(b) In Certificate of Approval No 5/6B/21A dated 31 January 1994, the Condition of Approval referring to the expiry of the approval should now be deleted.

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/21A - 1

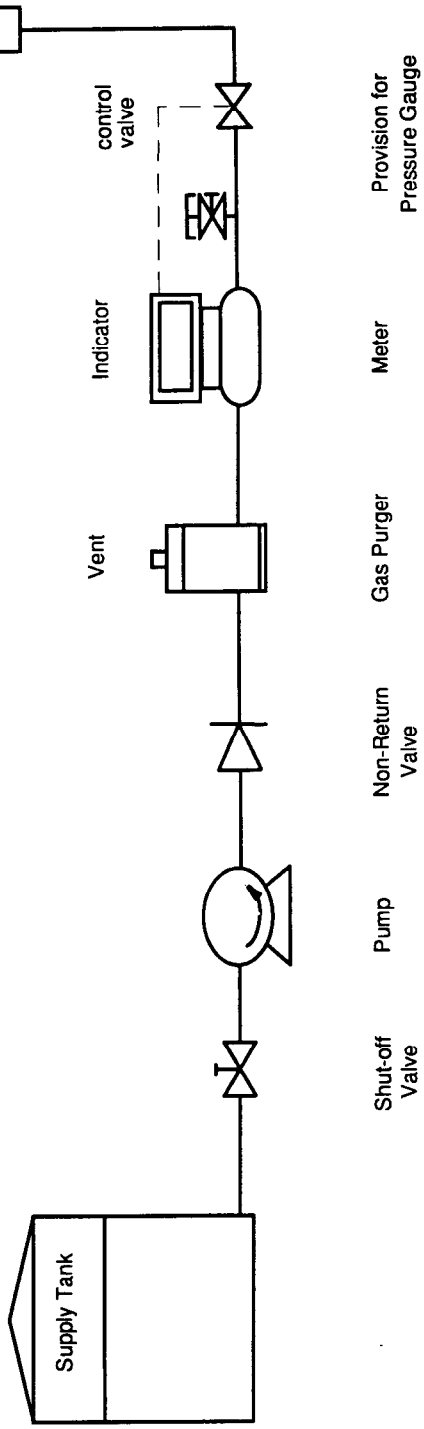


Typical Pipeline Flowmetering System

FIGURE 5/6B/21A - 2

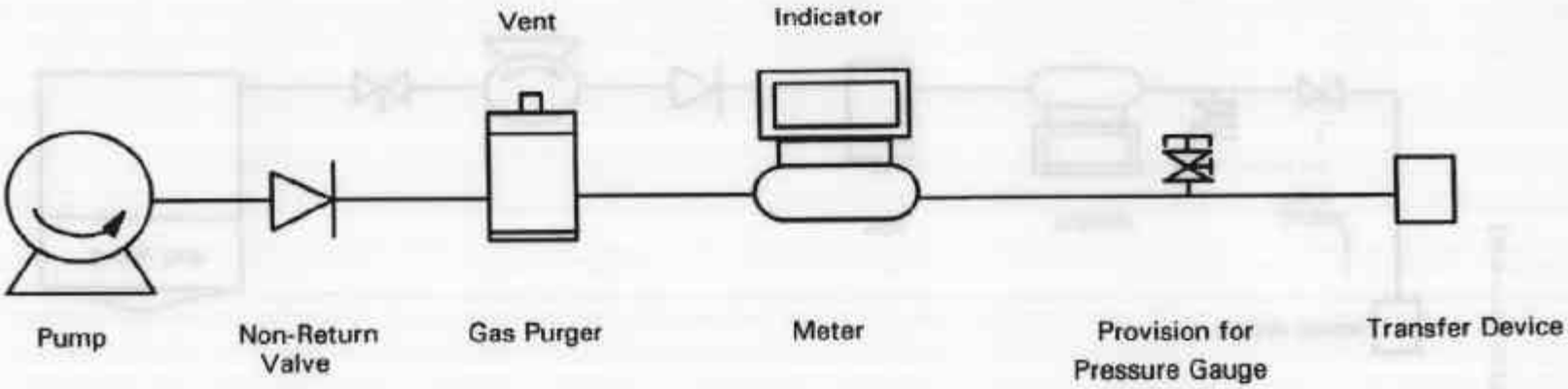
Smith Model LT-11 Flowmeter

FIGURE 5/6B/21A - 3



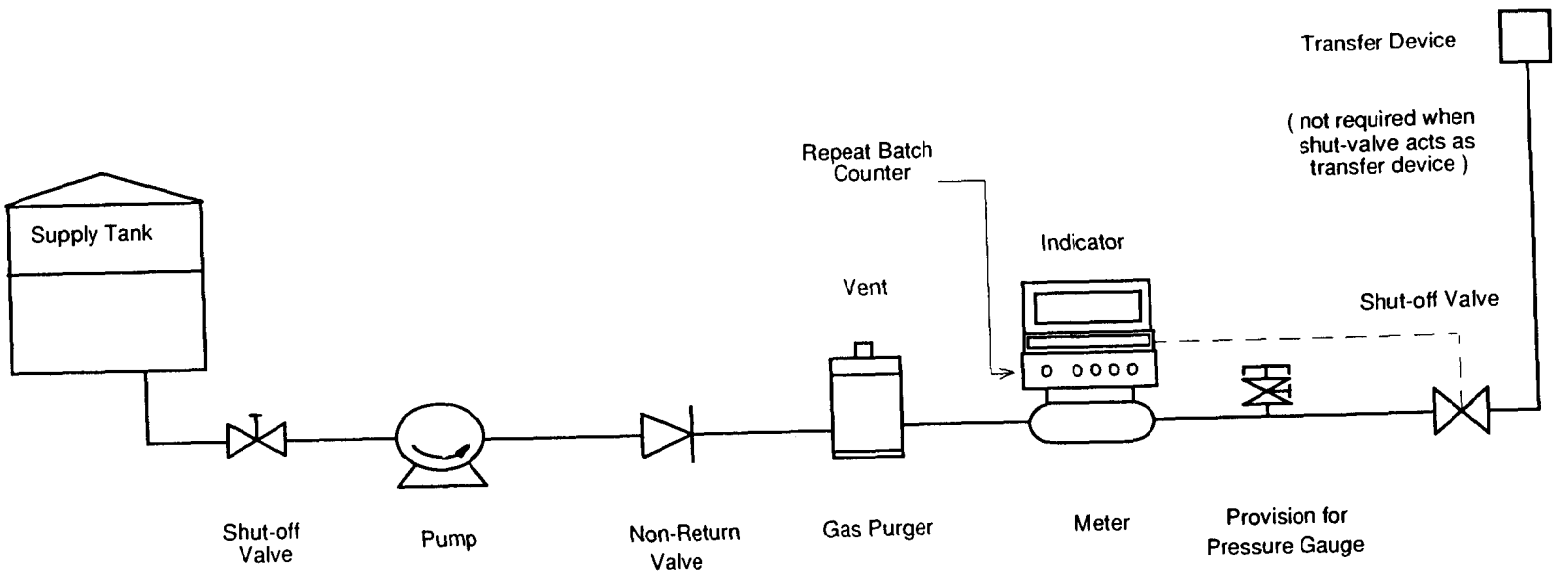
Typical Loading-rack Flowmetering System

FIGURE 5/6B/21A - 4



Typical Modular Flowmetering System

FIGURE 5/6B/21A - 5



Typical Drum-filling Flowmetering System

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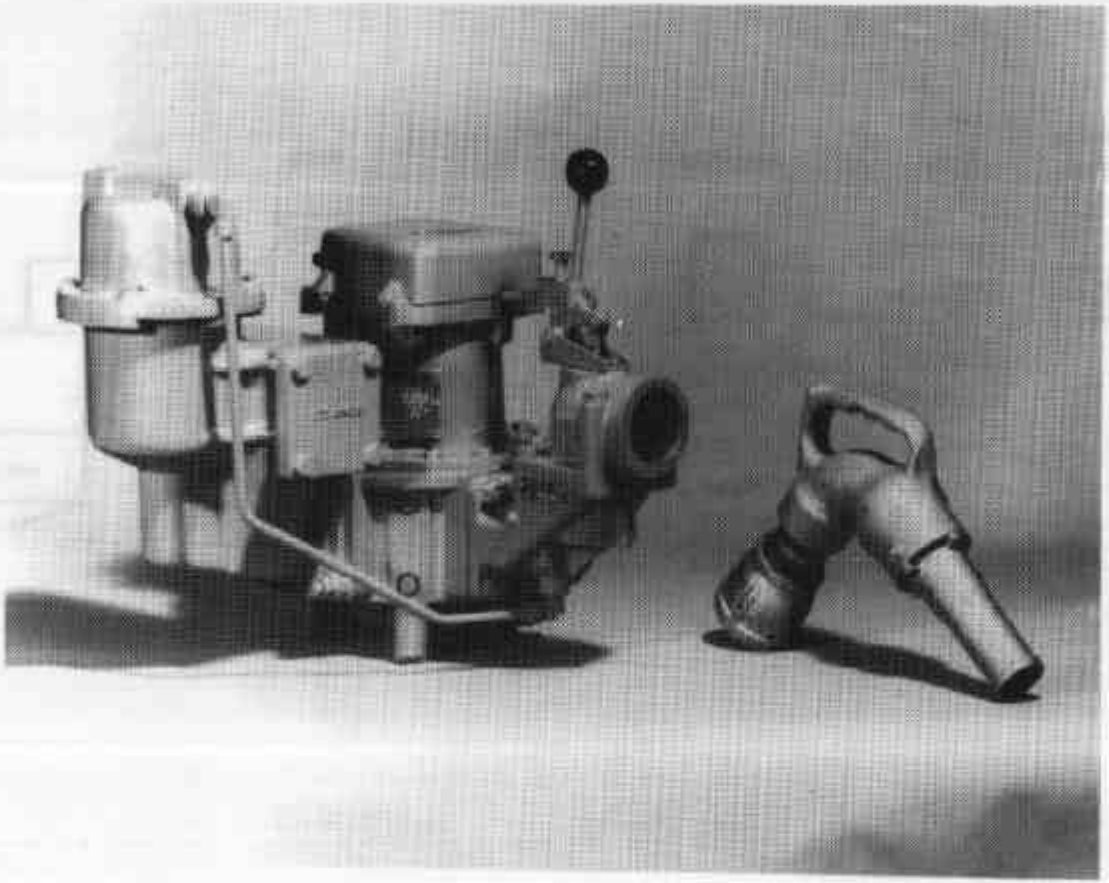
FIGURE 5/6B/21A - 6



Smith Model LT-11H Drum-filling Flowmeter