Department of consumer and corporate affairs / Ministère de la consommation et des corporations

STANDARDS BRANCH - DIRECTION DES NORMES

# NOTICE OF APPROVAL G - 50

OTTAWA May 12, 1970.

COMPAGNIE DES COMPTEURS
"FLUXI" TURBINE GAS METERS

## Apparatus

| Meter designation, Model No. | 7* | 14* | 28 | 56 | 113 |
|---|---|---|---|---|---|
| Rated capacity, cu. ft. per hour at line conditions | 7,000 | 14,000 | 28,000 | 56,000 | 113,000 |
| Capacity per revolution of drive for flexible cable, cu. ft. | - | - | 100 | 100 | 1,000 |
| Maximum working pressure, psi | 275 | 275 | 275 | 275 | 275 |
| Maximum, approved pressure for billing measurement, psi | 0.4 | 0.4 | 125 | 125 | 125 |
| Meter connections, flange | 3" | 4" | 6" | 8" | 12" |
| Register multiplier for volume units in cu. ft. | X1 | X10 | X10 | X10 | X100 |

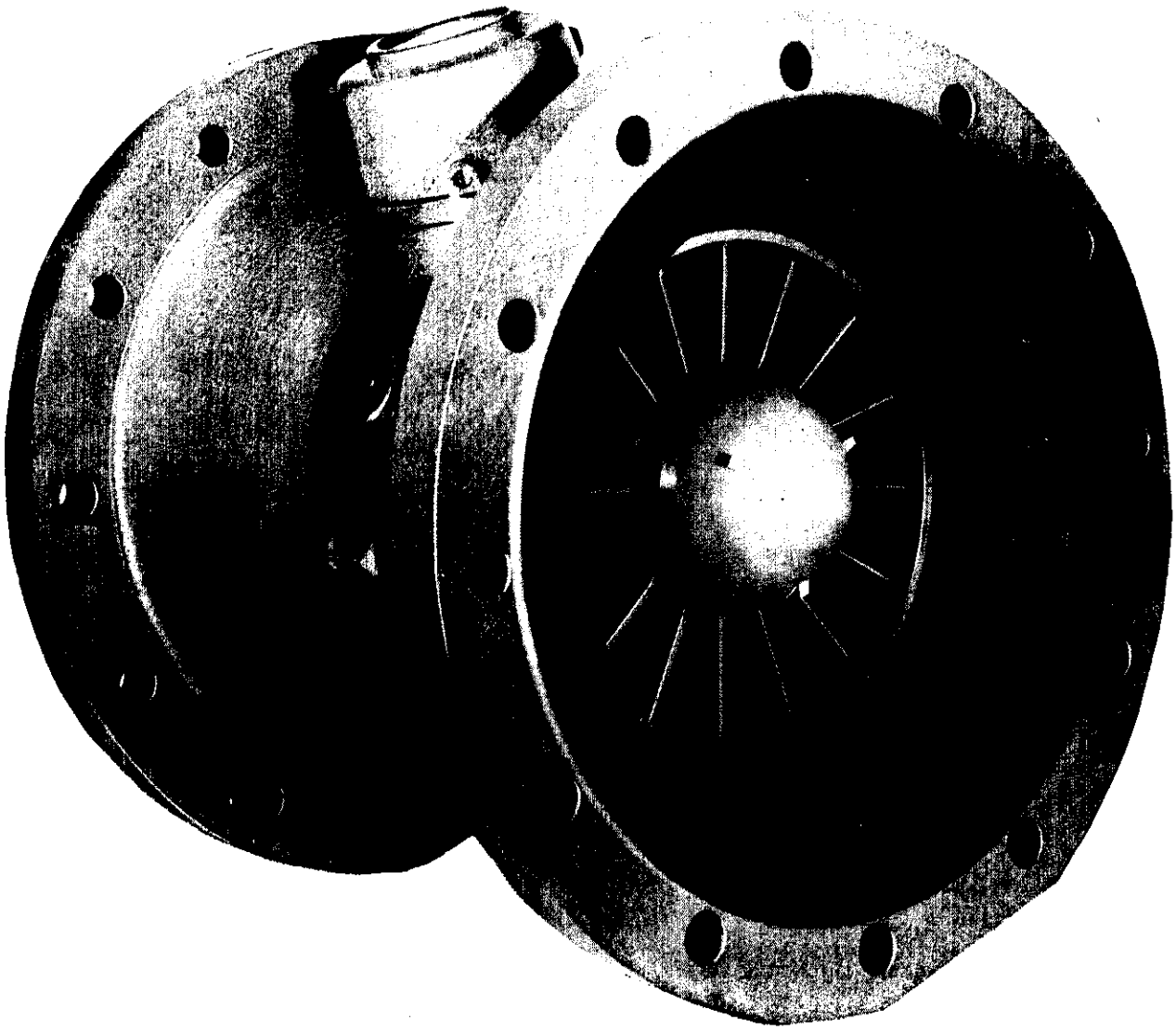
* Note: These models cannot be adapted for connection to any auxiliary pressure correcting devices and they are intended, and APPROVED FOR USE ON LOW PRESSURE ONLY of approximately seven ounces per square inch.

## Description

The Fluxi meter measures gas by utilizing the basic principle of a turbine.

This in-line mounted meter consists of four basic assemblies, illustrated in details on the diagrammatic section of a Fluxi meter, and designated as (a) the measuring element, (b) the magnetic drive, (c) the direct reading index and (d) the body.

The measuring element is a streamlined body comprising the front spherical section (4), the turbine (5) and the rear cone (15) inside a tube (7). The turbine blades (6) rotate in the most restricted part of the gas stream and



are between the centre and the tube. The centre is held to the tube by the guide vanes (1) upstream and downstream of the turbine. The turbine is supported on a spindle (17) which runs in ball bearings (14). The drive from the turbine spindle is through the gear train (16) to the transmission shaft (12).

The principal feature of the measuring element is the aerodynamic brake which consists of a fixed ring with inclined vanes (2) and an annular ring with radial ribs (3) which is integral with the turbine. The brake reduces the effect of the variations in load forces and minimizes the axial thrust on the turbine bearings.

The magnetic drive consists of two tubes, the transmission shaft (12) and the outer tube (13) connected to the index (10) by the magnetic coupling (11) The magnetic coupling eliminates a stuffing box and its associated problems and ensures a gas-tight seal at all times.

The index (10) is seven digit direct reading and requires a driving torque of only a sixtieth (1/60) of the torque available from the magnetic coupling. It can be turned and clamped in any position to give ease of reading, and may be removed from the meter for service without interruption of the gas supply. Models 28, 56 and 113 are equipped with indexes which contain a side outlet to which a flexible cable can be attached for connection to a suitable volume correcting device.

The body (8) is of tubular shape with integral flanges (9). The measuring element is located at the centre of the body and held in place by the outer tube (13).

(See Diagrammatic Section on Page 4)

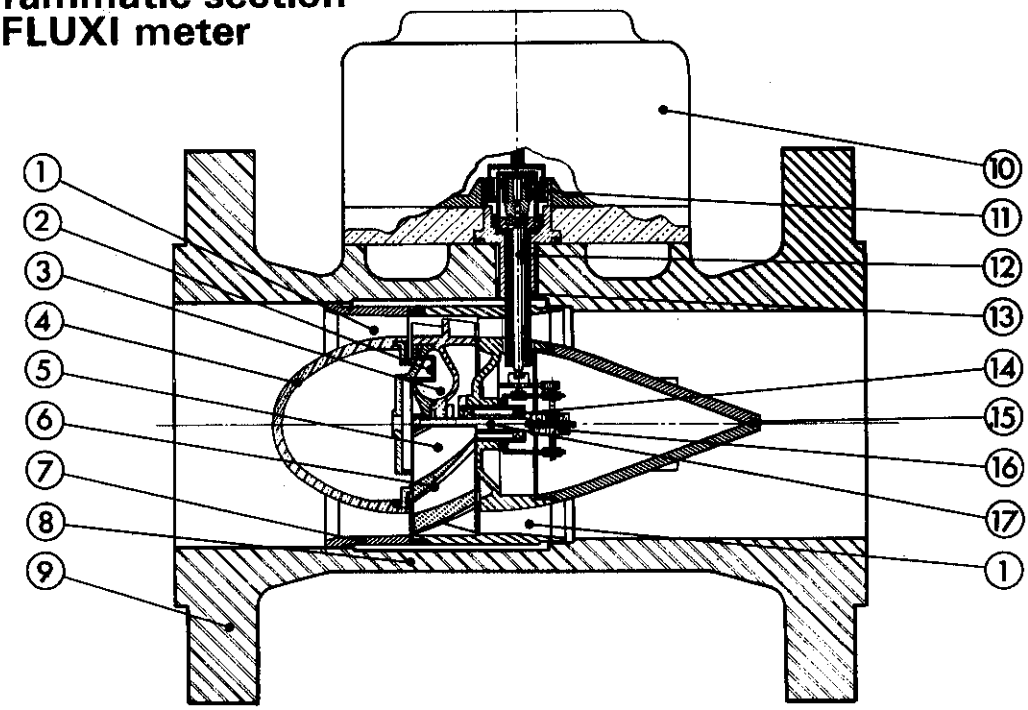
Construction Materials

The measuring element is manufactured in five sizes for maximum flows of 7000, 14000, 28000, 56000 and 113000 actual c.f.h. The three smallest sizes are made from precision moulded glass filled Rilsan. On the three largest sizes, only the turbine is moulded in glass filled Rilsan, the static pieces being an aluminium alloy casting. Glass filled Rilsan is a stable and tough material suited to withstand the abrasive action of small dust particles. Its expansion coefficient is almost exactly that of the aluminium alloy thus ensuring, in the larger sizes, that there are no tolerance problems due to temperature.

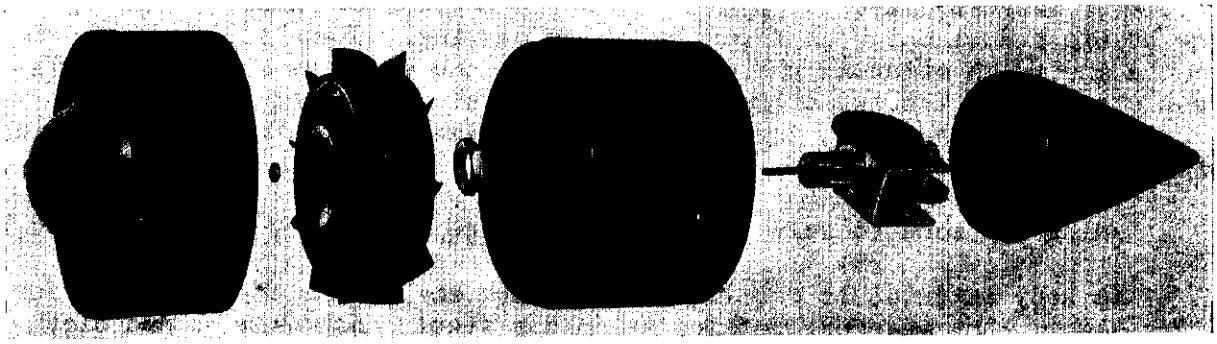
Bodies are made to suit five different pipe sizes, 3", 4", 6", 8" and 12".

The body material is ductile iron for two smaller meters and steel for other sizes. The gearbox contains stainless steel, and resin bonded cloth laminate. The transmission shaft and positioning tube are both made from stainless steel.

## Diagrammatic section of a FLUXI meter




Exploded view of measuring element



The index is common to all sizes of meters except as noted above. The gearing and polystyrene numbered rollers forming the index are mounted on a nickel-plated brass baseplate which is retained on the meter by an annular nylon retaining ring. The latter also provides a seal between the baseplate and the zinc diecast top cap. The top cap is clamped to the meter by three grub screws which locate in a slot in the meter casting. The screws can slide in the slot enabling the index to be rotated for easy reading from any angle. The circular glass window is retained by a nylon mounting ring giving a shock-resistant waterproof seal.

The maximum length of approved flexible cable for connection to a volume correcting device is 6 feet. The cable has a stamped designation C70 on the metal sleeve at the end which connects to the meter index. Special low temperature grease is used in this cable which has a P.V.C. covering on the outside.

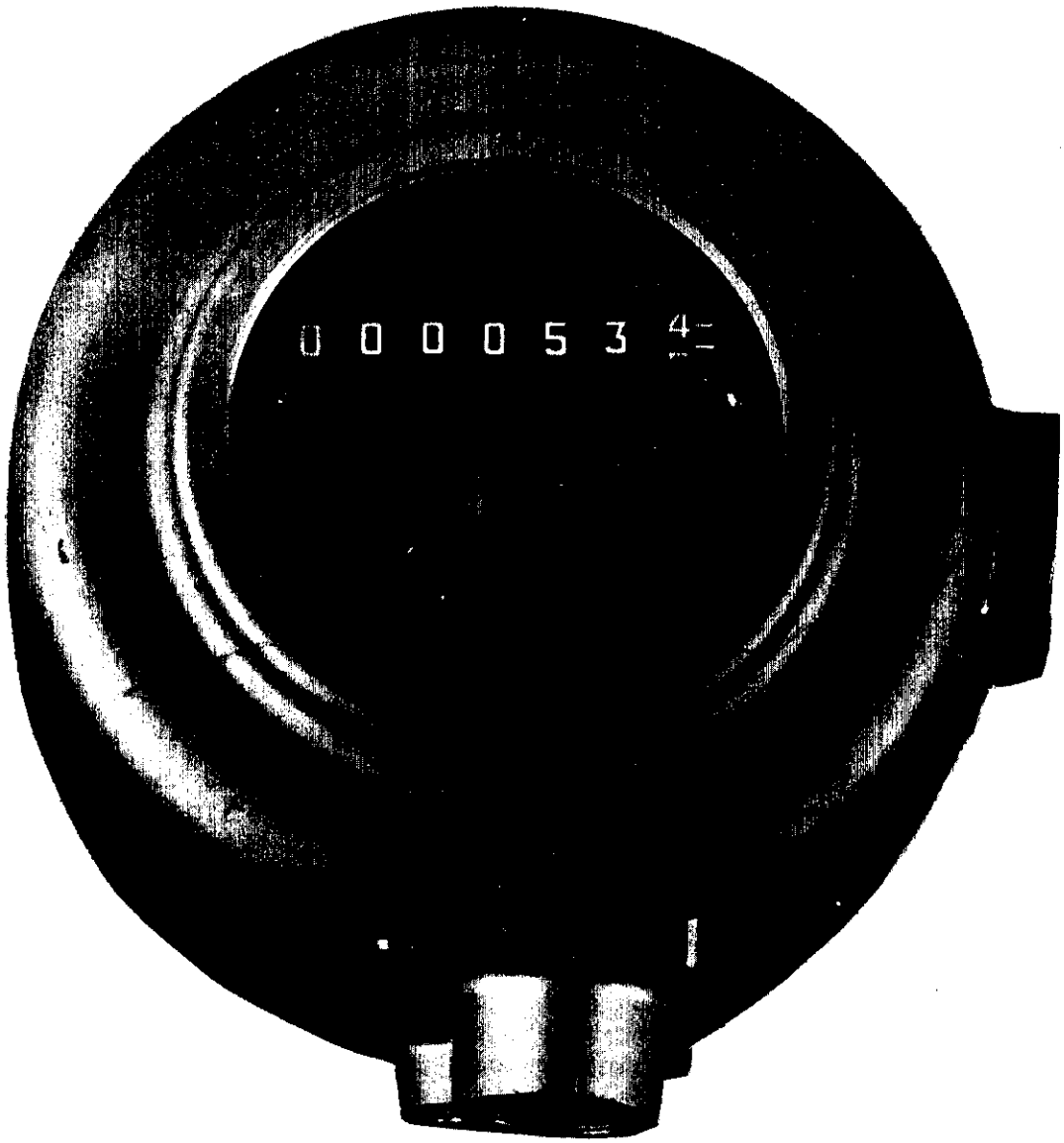
When in use for billing this flexible cable should not have bends of smaller radius than 12 inches.

In operation the gas which enters the meter is deflected around the inlet diffuser thus increasing its velocity prior to impinging on the rotor. The passage of the gas stream over the rotor blades exerts a force that causes the rotor to revolve with a speed directly proportional to the rate of flow of the gas. However, should the gas stream enter the meter with a non-uniform velocity distribution (sometimes referred to as jetting) the proportionality of the rotor speed to the flow rate may be upset and meter accuracy affected.

The rated capacity of the turbine meter indicates the maximum permissible flow rate in cubic feet per hour at actual line conditions (maximum dial rate) and this rate governs for all meter operating pressures. The registration of the minimum flow at line conditions depends on the density of the gas and decreases as the line pressure increases. The actual flow, in standard cubic feet, increases due to the pressure factor.

The turbine meter measures gas volume at line conditions and when these fluctuate and billing volume refers to other than meter conditions, suitable and approved volume correcting devices shall be used to account for changes in volume caused by the effects of temperature and pressure. The pressure connection to the correcting device shall be taken from a pipe fitting at the upstream side of the meter.

The temperature probe for the auxiliary device should not interfere with the symmetry of flow through the turbine and may be located downstream in a position that does not interfere with the discharge of the meter, usually about two pipe diameters downstream.


0 0 0 0 5 3 4

The computation of the volume of a gas, at the contract temperature and pressure, which has been registered in cubic feet at line conditions is based on the ideal gas laws modified by a deviation factor available in the form of a Supercompressibility factor (Fpv), determined according to the A.G.A. Gas Measurement Committee Report No. 3, Orifice Metering of Natural Gas.

The general equation for converting the meter readings at line conditions to a contract base pressure and temperature is

$$Qs = Qd\ Pm\ Tm\ (Fpv)^2$$

Qs = Quantity of gas at the contract base pressure and temperature, cu. ft.

Qd = Actual (displaced) volume of gas passed at existing meter conditions, cu. ft.

Pm = Pressure multiplier

$$= \frac{\text{Weighted average existing gauge pressure + barometric pressure}}{\text{Absolute pressure base}}$$

Tm = Temperature multiplier

$$= \frac{\text{Temperature base + 460}}{\text{Weighted average flowing gas temperature + 460}}$$

Fpv = Supercompressibility factor based upon the weighted average gas pressure and temperature and the normal composition of the gas. The composition is represented by its specific gravity, its content of nitrogen and carbon dioxide and its calorific value as used in the derivation of Fpv values.

The selection of the weighted average supercompressibility factor, Fpv, should be based on a record of the flowing gas volumes, pressures and temperatures. If no continuous record is available, the variations in pressure and temperature normally existing in the line must not introduce an error greater than ±0.5% in the selected $(Fpv)^2$ factor.

All meters accepted for service shall be effectively sealed by the field inspector to ensure that no part of the measuring unit may be tampered with.

## Installation

This turbine meter may be installed in any position, vertical or horizontal, and levelling is not critical. It may be supported by the pipework, however, to minimize the effect of pipestrain the mating flanges of the system should be in line and correct distance apart, with all relevant pipe work properly supported.

The meter should be positioned away from the lowest point in the system to prevent contamination from liquids and other foreign matter. A line filter is not required but some form of mesh filtration is advisable.

Hydraulic pressure testing of the system must be carried out without the meter in position, followed by a thorough cleaning and drying before refitting the meter.

It is imperative that all foreign matter be removed from the pipeline before the meter is commissioned.

An inherent characteristic of turbine meters is that they can be inaccurate when used on short duration loads. This is due to the momentum of the turbine which in the Fluxi meter is partially offset by the aero-dynamic brake. However there is an inaccuracy produced if the operating period is less than 3 minutes at maximum flow or less than 10 minutes at 1/10th of maximum flow.

The metering station must include a by-pass and test connections for testing and servicing the meter.

Note: The rangeability of the turbine meter may be adversely affected by a torque load imposed by some volume correcting devices.

The meter nameplate, affixed to the meter body shall include the following information:

1) Canadian distributor's name.
2) Manufacturer's name.
3) Meter's model designation and serial number.
4) Capacity of the meter, cu. ft./hr.
5) Maximum working pressure, psi.

The information pertinent to each meter installation shall be recorded by the Utility on a Standards Branch Gas Metering Installation Data Sheet, No. SG-1, and filed with the District Inspector of Electricity and Gas Division prior to the initial verification of the meter in the field.

Approval granted to:

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