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

STANDARDS BRANCH - DIRECTION DES NORMES

NOTICE OF APPROVAL - AVIS D'APPROBATION

NO. S.WA-877

DATE October 19, 1973

A.O. SMITH-MODEL ATC AUTOMATIC TEMPERATURE COMPENSATOR

MANUFACTURER: A.O. Smith Meter Systems
Erie, Pennsylvania
U.S.A.

DEVICES LISTED: Model ATC automatic temperature compensator for use on liquefied petroleum gases or heated petroleum products.

Temperature Ranges (degrees Farenheit)

-50 to 100, 0 to 150, 50 to 200, 125 to 225, 175 to 275, 175 to 375, 225 to 425, 275 to 475, 325 to 525.

Coefficient of Expansion Range

API gravities 0 to 150°
API groups 0 to 7
S.G. at 60/60°F of 1.075 to 0.500 (petroleum)

APPLICATION: For use with meters at fixed installations, such as bulk plants, pipe lines, etc.

SPECIAL CONDITIONS: As specified in S.WA-844

DESCRIPTION: The model ATC automatic temperature compensator is fully described in A.O. Smith bulletin 1.6.4.2, copies of which are available at each District Office of Weights and Measures.

TESTING AND TOLERANCES: As specified in S.WA-844

REFERENCES: G 1151-57/S505-745
GL1151-57/S505-745

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CONDITIONS OF APPROVAL: Approval is granted under the Weights an Measures Act, R.S.C., 1970, c.W-7 and Regulations thereunder (P.C. 6894) for use in Canada under the general conditions of P.C. 6894, and under any special conditions listed above.

R.W. MacLean,
Director General,
Standards Branch

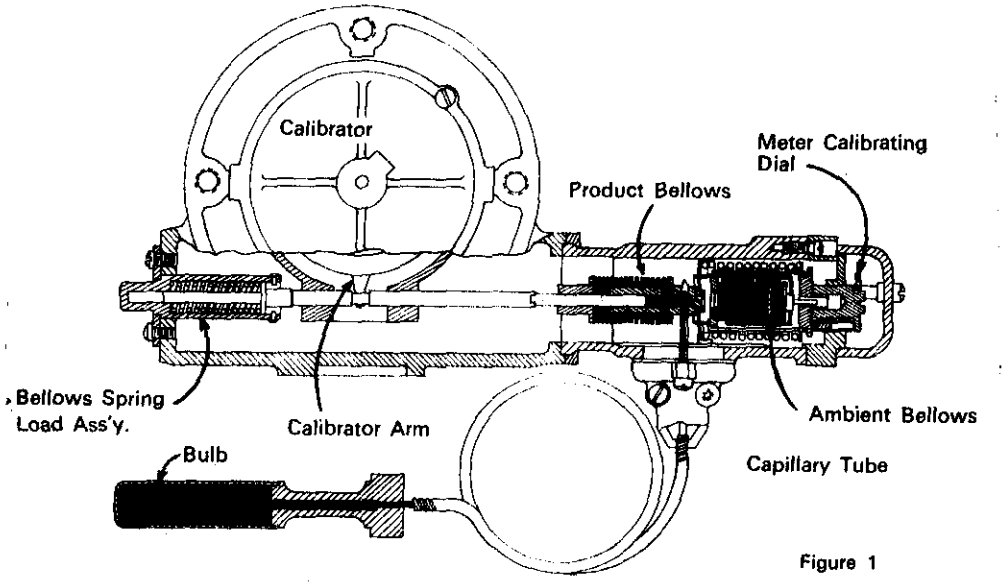

Figure 1

PRINCIPLE OF OPERATION

The ATC consists of:

1. Thermal System
2. Calibrator System

The thermal system consists of the bulb and bellows Assembly, and the ambient bellows Assembly. See Figure 1. The bulb is immersed in the metered liquid so that temperature changes of the liquid cause a change in volume of the bulb filled liquid. This volume change is transmitted through the capillary tube to the product bellows providing linear movement of the bellows in response to bulb temperature change. Both the product bellows and ambient bellows increase in length with an increase in ambient temperature. Design is such than an increase in ambient bellows length causes a decrease in length of the complete ambient bellows assembly. This, then, compensates for changes in length of the product bellows, and other components in the unit, due to ambient temperature changes.

The calibrator integrates gross volume from both the calibrator input revolution and linear movement produced by the thermal system to provide net volume in the form of calibrator output revolutions. The calibrator utilizes two over-riding clutches and an eccentric. A change in the amount of eccentricity varies the drive ratio between the calibrator input shaft and output shaft. The thermal system movement positions the calibrator plunger which in turn positions the eccentric arm. An increase in temperature results in less eccentricity and reduced registration. A decrease in temperature causes greater eccentricity which increases registration. For a detailed explanation of calibrator operation see bulletin 1.6.4.3.

Thermal system movement is strictly dependent on temperature change and is independent of the metered liquids' coefficient of expansion. Since the coefficients of expansion of the various liquids vary widely, the eccentric arm fulcrum pin is positioned to change the amount of calibrator correction with respect to thermal

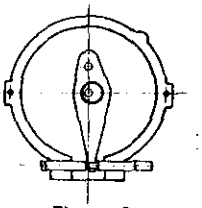

Figure 2

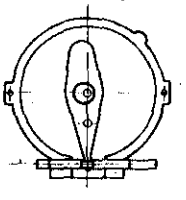

Figure 3

system movement. Figure 2 shows fulcrum pin location for 18° API temperature compensation. This relatively low coefficient of expansion (.00039/°F) requires a rather high degree of thermal system and plunger movement to effect a nominal change in eccentricity and calibrator correction. Figure 3 shows fulcrum pin location for .580 specific gravity temperature compensation. This relatively high coefficient of expansion (.0011/°F) requires little thermal system and plunger movement to effect a rather high change in eccentricity and calibrator correction.