INSTRUCTION BULLETIN

10B9017
CALIBRATION OF KINETIC MANOMETERS

INSTRUMENT SHOP CALIBRATION

The ABB Kinetic Manometer is a variable area bypass type instrument designed to measure fluid flow in conjunction with an orifice plate. When checking the calibration of the Kinetic Manometer make certain that the range orifice is in place. The range orifice may be included as part of the Flowrator meter inlet or outlet fitting or it may be a separate assembly depending upon the type of Flowrator.

Fig.I shows the arrangement of equipment necessary for shop calibration. The calibrating fluid may be air, water, or any non-hazardous and noncorrosive fluid. The minimum test flow rate is 5 GPM for liquids and 15 CFM for gases.

ABB Kinetic Manometer ranges are based on "wet calibrations". For example, the 100" range orifice is designed for a 100" water column differential at the main line orifice when metering a liquid which has a specific gravity of 1. Table I shows the maiin line orifice differential pressures corresponding to various percents of maximum flow for a liquid that has a specific gravity of 1 and for air. If the calibrating fluid is a liquid having a specific gravity other than 1, refer to the section on Specific Gravity corrections. If the Kinetic Manometer has an indicating pointer and scale, the pointer should be at the "reference" graduation on the scale at zero flow. If necessdry, the scale can be moved vertically to achieve this alignment before calibration is started.

To check calibration: open the shutoff valves; adjust the hand valve in the main line to obtain readings on the test manometer corresponding to main line orifice differential pressures listed in the appropriate column of Table I; check the pointer (or float) positions against scale readinq values given in the table. A discrepancy at each check point indicates probable corrosion, or foreign material build-up in the range orifice or Kinetic Manometer.

Servicing instructions for the meter are given in a separate bulletin. If a pneumatic transmitter is included, its output should be checked with a separate manometer against values given in Table I. Ifi necessary, the transmitter may be adjusted as outlined in a separate bulletin.

The standard scale, furnished on V/A Cell Kinetic Manometers, may be used with 100", 150" and 200" range orifices. Scales for 50" and 500" range orifices are different and are sometimes placed on the back of standard scales.

FIELD CALIBRATION

When flange taps are used, the calibration can be checked as described in the preceding section. The test manometer or gauge must be able to withstand main line pressure; connect it toflange taps located 180° from the manometer taps. When vena contracta or pipe taps are used, pipe the test manometer as shown in Fig.II. Open valves alternately in the lines to the Kinetic Manometer and to the test manometer (lines to the test manometer must be closed when taking readings on the Kinetic Manometer) and compare test manometer readings with values from Table I. Take sufficient readings to assure that the main line now has not changed while checking a particular point.

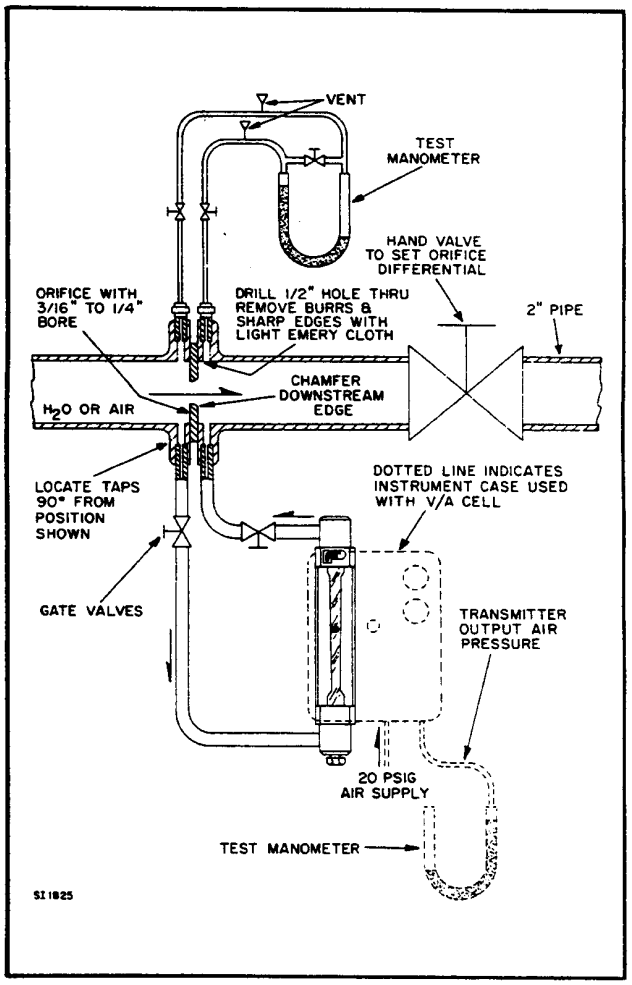

FIG. I. SHOP CALIBRATION PIPING

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SPECIFIC GRAVITY CORRECTIONS AND OTHER CALCULATIONS

For calibration purposes, new main line orifice differential pressures must be calculated to replace those given in Table I whenever the calibrating fluid is a liquid having a specific gravity other than 1. The equation is:

$$\Delta P_2 = P_1 \times (\rho_f - \rho_W) / (\rho_f - 1)$$

where:

ΔP_2 = main line orifice differential pressure to set, or as read on the test manometer, in inches of water column.

P_1 = "Wet" differential pressure from Table I.

ρ_W = specific gravity of test liquid.

ρ_f = specific gravity of float — stainless steel floats, sp. gr. 8.02, are usually furnished.

If a mercury manometer is used as the calibration standard (instead of a water manometer) when the test fluid is a liquid, a correction must be made for the bouyancy effect of the liquid. Convert "wet" main line orifice differentials given in Table I to corrected inches of mercury by dividing by 13.59 (specific gravity of mercury) minus the specific gravity of the test liquid. For example, 100" water column is equal to 7.95" mercury column when the calibrating fluid is water: $100/(13.59 - 1.0) = 7.95$.

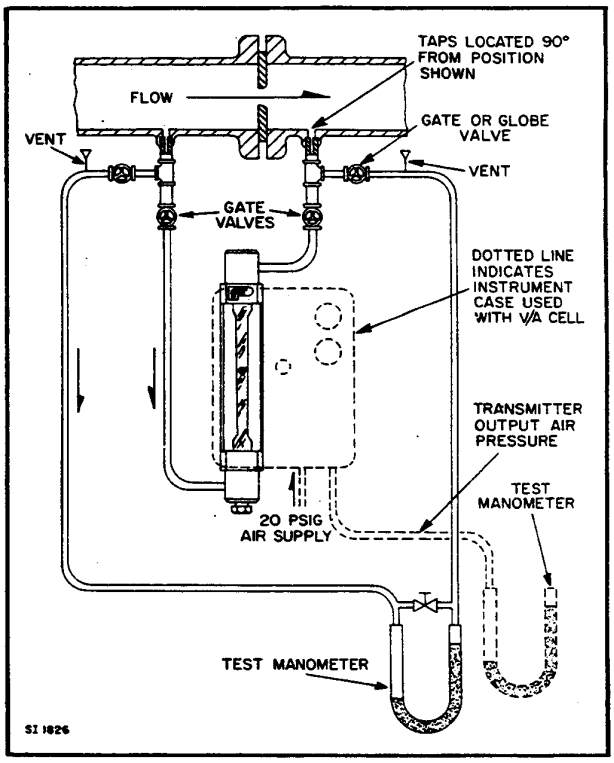

FIG. II. FIELD CALIBRATION PIPING

Scale Reading % of Total Max. Flow	Instrument Transmitted Pressure PSI Gage (when applicable)	MAIN LINE ORIFICE DIFFERENTIAL — INCHES WATER COLUMN							
		50" Range Orifice		100" Range Orifice		150" Range Orifice		200" Range Orifice	
		Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
10	15.0	50.0	57.2	100.0	114.3	150.0	171.8	200.0	229.0
9	13.8	40.5	46.3	81.0	92.7	121.4	139.0	162.0	185.3
8	12.6	32.0	36.6	64.0	73.2	96.0	109.9	128.0	146.4
7	11.4	24.5	28.0	49.0	56.1	73.5	84.1	98.0	112.2
6	10.2	18.0	20.6	36.0	41.2	54.0	61.8	72.0	82.3
5	9.0	12.5	14.3	25.0	28.6	37.5	42.9	50.0	57.2
4	7.8	8.0	9.2	16.0	18.3	24.0	27.5	32.0	36.6
3	6.6	4.5	5.2	9.0	10.3	13.5	15.5	18.0	20.6
2	5.4	2.0	2.3	4.0	4.6	6.0	6.9	8.0	9.2
1	4.2	----	----	----	----	1.5	1.7	2.0	2.3
*Ref.	0	----	----	----	----	----	----	----	----

*Ref. stands for minimum float position or that position at which the float comes to rest at zero flow.

TABLE I

Notes to Table I

- Reference to "dry" differential is for gases.
- Reference to "wet" differential is for liquid with sp. gr. 1.0.
- For other fluids, use sp. gr. correction formula.