BRODIE International

Model 4400 Automatic Temperature Com-

DESCRIPTION

The Brodie Model 4400 Automatic Temperature Compensator is a device which automatically and continuously corrects a meter counter to indicate the volume that a metered delivery would occupy at a selected base temperature. Base temperature is either 60°F, 20°C or 15°C depending upon which model ATC is selected. Each ATC is equipped with a locknut position to provide an uncorrected counter readout with respect to the base temperature (a feature used primarily during calibration procedures).

DESIGN FEATURES

- Base Temperature Lockout Feature - Allows proving of meter at gross (uncompensated) volume. Lock-out provides 1:1 ratio through ATC when engaged.
- Three scales provided - Coefficient of expansion, API gravity degrees and specific gravity.
- Designed for easy field adjustment of scale setting
- Applicable to a wide range of industrial liquids.
- Compact, streamlined design.

PRINCIPLE OF OPERATION

The Brodie Model 4400 Automatic Temperature Compensator utilizes a thermal system in conjunction with a gear train to provide a register drive that compensates a register readout for the effects of thermal expansion and contraction of the metered liquid.

The ATC operates on the principle of subtraction. Rotational input from a meter is increased in velocity through the ATC gear train, and the thermal system determines the exact amount to be subtracted for proper, compensated, rotational output to a register.

Figure 2 illustrates how temperature compensation is accomplished. During ATC operation, input from a meter is transmitted from the compound input gear (1) through the compound idler gear (2) where the rotational velocity is increased. This speed-up is applied to the output gear (3) through four planetary gears (4).

In the thermal system, the temperature sensing bulb (5), which is installed in the meter housing or adjacent piping, senses changes in product temperature directly through the thermowell and thermal conduction sleeve. Product temperature changes are transmitted by the bulb through the capillary tube (6) to the product bellows (7).

The ambient bellows (8) compensates for changes in the temperature of the surrounding environment affecting the capillary tube and product bellows in such a manner that the movement of the friction roller on the platform gear is

Model 4400 Automatic Temperature Compensator.

a reflection of product temperature changes only. In other words, the ambient bellows cancels any effect of ambient temperature changes on the product bellows and capillary tube.

Changes in product temperature are relayed by the expansion and contraction of the product bellows to position the friction roller (10) on the platform gear (11). This action takes place across a variable pivot point (9). The pivot point is representative of the coefficient of expansion setting indicated on the scale.

The compound input gear drives the platform gear through an idler gear (12), and the platform gear drives the friction roller. The friction roller drives the external teeth of the planetary ring gear (16) through the worm gear (13), worm wheel and spur gear assembly (14), and idler gear (15). The internal teeth of the ring gear are also in contact with the four planetary gears.

As product temperature increases, the product bellows expands, the friction roller moves outward on the platform gear, the ring gear rotates faster, and more is subtracted from the rotational output so that a register would indicate the correct (or compensated) amount.

As product temperature decreases, the product bellows contracts, the friction roller moves inward on the platform gear, the ring gear rotates more slowly, and less is subtracted from the rotational output so that a register would indicate the correct (or compensated) amount.

During base temperature lockout operation, the compound input gear drives the base temperature lockout gear (18) directly through the lockout gears (17). This provides a direct

(uncompensated) 1:1 gear ratio drive through the ATC, thus overriding the temperature compensating system. Changing from the ATC mode of operation to lockout operation is accomplished by moving a lever at the rear of the Automatic Temperature Compensator which engages or disengages the lockout gears.

SPECIFICATIONS

⚠ WARNING

Do not operate this instrument in excess of the specifications listed below. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

Ambient Temperature Range: -25°F to +125°F (-32°C to +52°C)

Optional Base Temperature: 60°F, 20°C or 15°C

Maximum Input Speed: 250 RPM

Maximum Torque Load on Output: 30 in. oz.

Capillary Tube Length: 48" or 84" Standard. (1219.2 mm or 2133.6 mm). Other lengths available.

Materials of Construction
Base Plate and Cover: Die-Cast Aluminum
Gears: Brass, Bronze, Stainless Steel
Bushings: Garlock Multitube 31
Springs: Stainless Steel
Window: Acrylic Plastic
Screws and Nuts: Stainless Steel, Brass , Plated Steel
Bellows: Copper Alloy
Bulb: Copper Alloy
Capillary Tube: Copper Alloy
Thermowell: Aluminum or Stainless Steel
Levers, Slides: Stainless Steel, Steel (Black Oxide Finish)

ORDERING INFORMATION

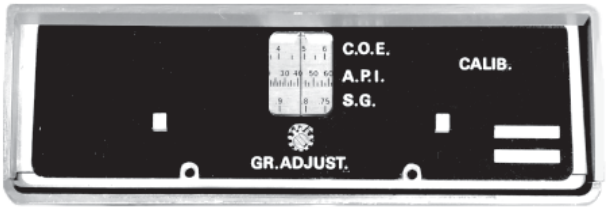
To order, please specify:

1. Liquid to be metered, specific gravity and viscosity.
2. Maximum and minimum temperature.
3. Capillary Tube Length or Meter Model and Accessory Stack-up.
4. Specify 60°F, 20°C or 15°C Base Temperature.

Temperature and Coefficient of Expansion Ranges

Coefficient of Expansion		Product Temperature			
		°Fahrenheit		°Centigrade	
Per °F	Per °C	Minimum	Maximum	Minimum	Maximum
.0003	.00054	-30	150	-34	66
.0004	.00072	-30	150	-34	66
.0005	.0009	-30	150	-34	66
.0006	.00108	-30	150	-34	66
.0007	.00125	-25	145	-32	63
.0008	.00144	-15	135	-26	57
.0009	.00162	-5	125	-21	52
.0010	.0018	0	120	-18	49
.006	.00108	-30	150	-34	66
.0007	.00126	-30	150	-34	66
.0008	.00144	-30	150	-34	66
.0009	.00162	-30	150	-34	66
.0010	.00180	-30	150	-34	66
.0015	.00270	-20	140	-29	60
.0020	.00360	0	120	-18	49
.0003	.00054	50	250	10	121
.0004	.00072	50	250	10	121
.0003	.00054	50	250	10	121
.0004	.00072	50	250	10	121
.0005	.0009	50	250	10	121
.0003	.00054	150	350	66	177
.0004	.00072	150	350	66	177
.0005	.0009	150	350	66	177
.0003	.00054	250	450	121	232
.0004	.00072	250	450	121	232

The front window of the ATC shows the three scales provided for universality.



Removing the front window provides easy access to the adjustments for scale setting and calibration.

Figure1 Front Window

Approximate Shipping Weight and Cube

Shipping Weight		Shipping Cube	
Pounds lbs.	Kilos kg.	Cubic ft.	Cubic meters
7-1/2	3.40	0.28	0.008

Approximate Shipping Dimensions
Inches: 5-1/2 x 8 x 11
Millimeters: 139.70 x 203.20 x 279.40

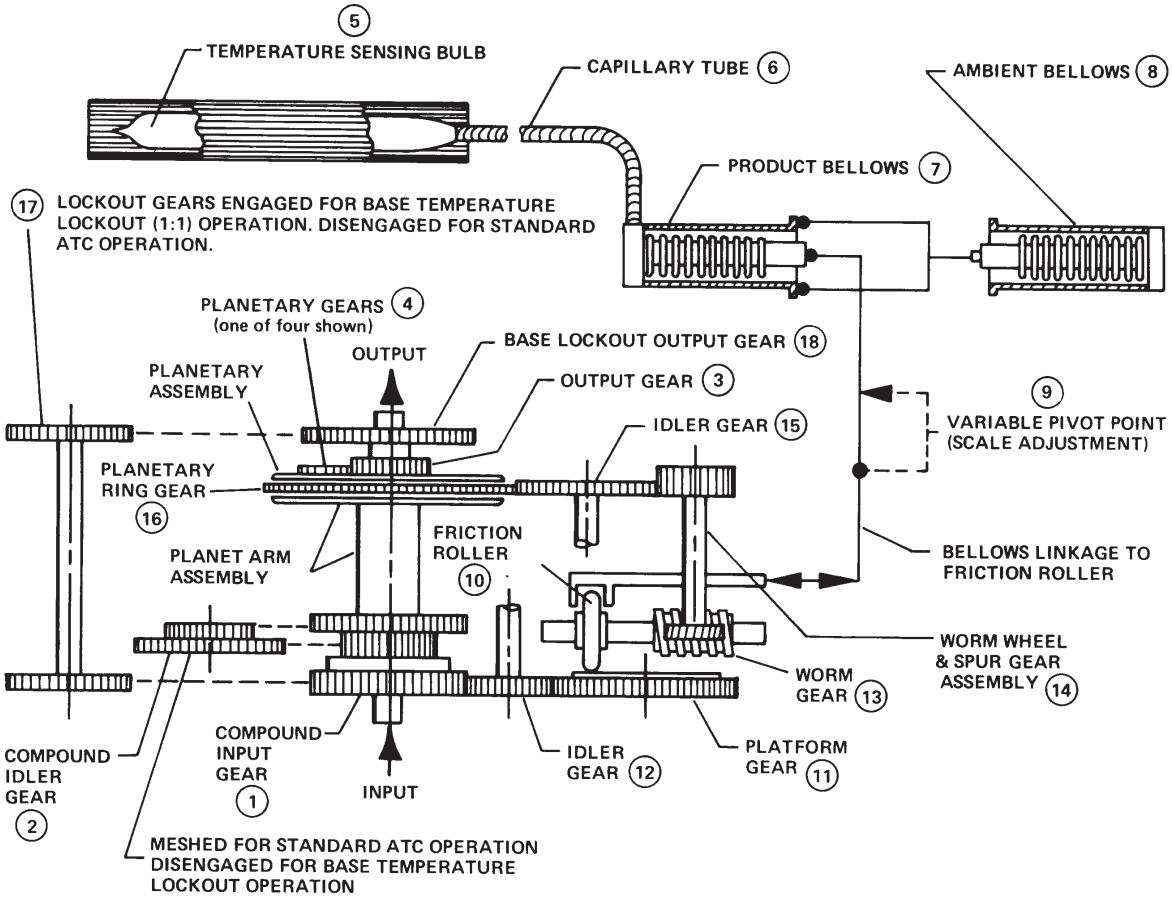


Figure 2 ATC Schematic Diagram

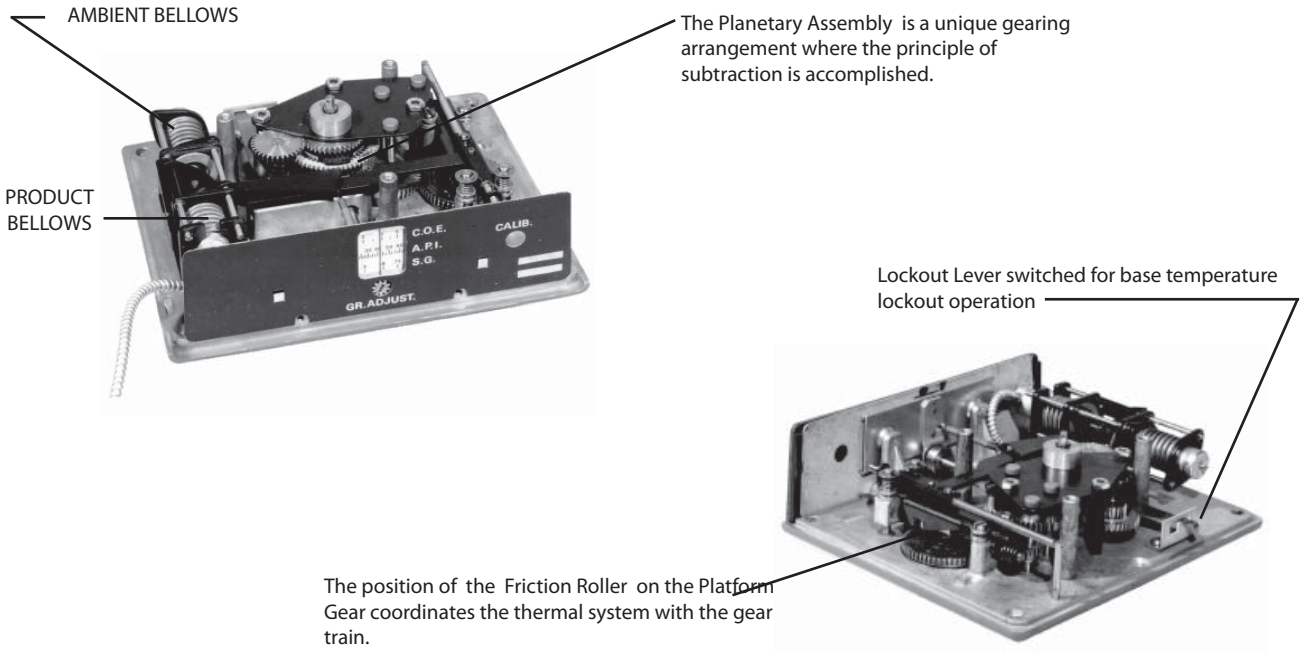
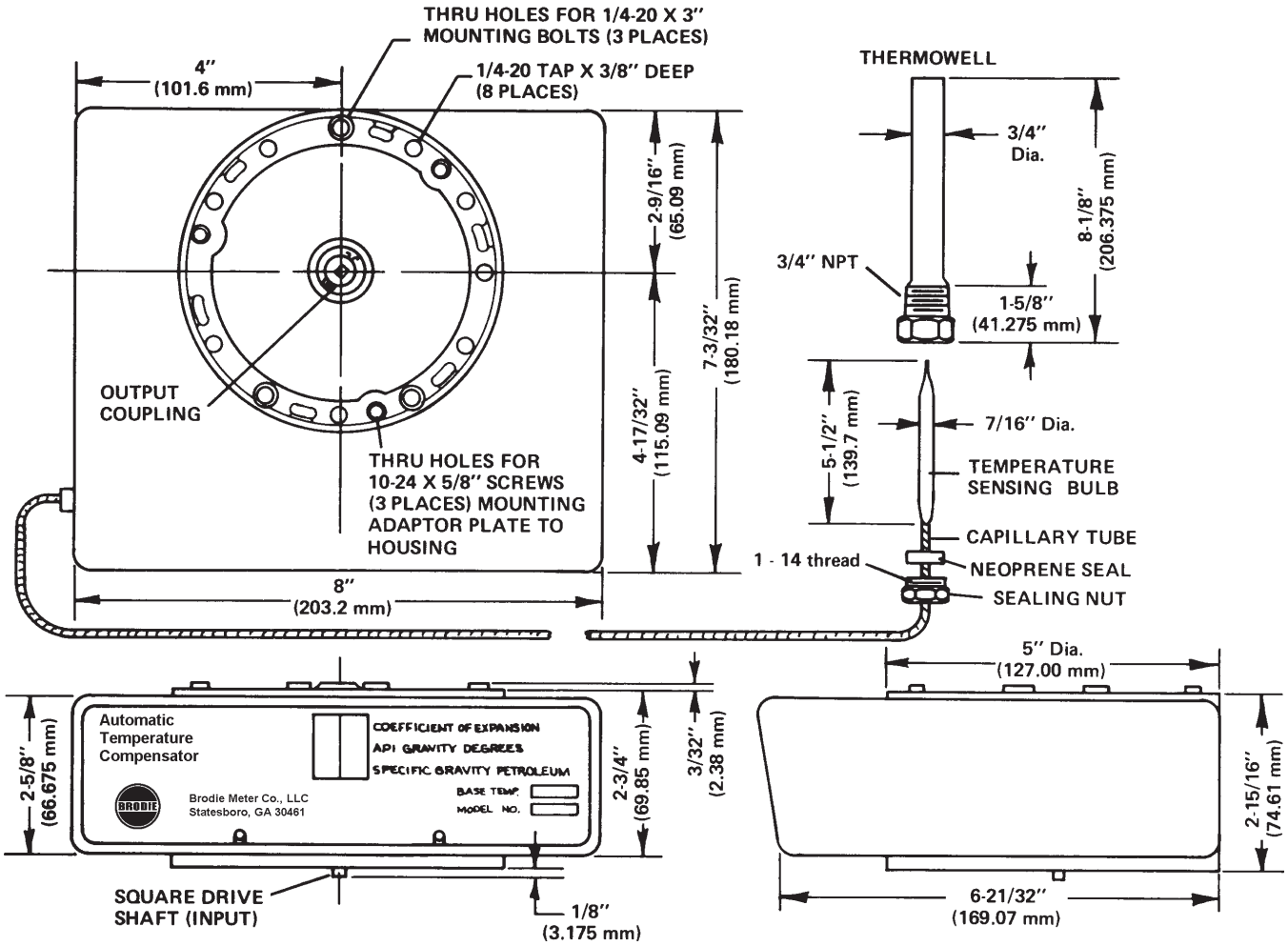


Figure 3 ATC with the Housing Removed Illustrates the Layout of the Thermal System and Gear Train

Dimensions (For Certified Dimensional Prints - Consult Factory)



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