A-182 GPC Exhibit II-182
Bockhold Ex. AA

05-259-OLA

GEORGIA POWER COMPANY
Inverness Building 40
P.O. Box 1295
Birmingham, Alabama 35242

NUCLEAR REGULATORY COMMISSION
Docket No. 50-424/425-OLA-3 EXHIBIT NO. II - 182
In the matter of Georgia Power Co. et al., Vogtle Units 1 & 2
☐ Staff ☒ Applicant ☐ Intervenor ☐ Other
☐ Identified ☒ Received ☐ Rejected Reporter SD
Date 9/7/95 Witness Georgia Bockhold

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COMMENTS: Please review and provide comments to Lewis Ward (205) 877-7802 or Ken Burr (205) 877-7836.

DG INSTRUMENT TEST OUTLINE

Phase I. Jacket Water Temperature Switch Reliability Evaluation

A. Perform a reliability evaluation of two new temperature switches (Calcon Model A3500), used for Jacket Water High Temperature switches on the Vogtle Electric Generating Plant (VEGP) emergency diesel generators. The purpose of the evaluation is to determine switch setpoint repeatability due to several factors which are outlined in the following test sequences. Additional tests, based on results of these tests, may be added by approval of the GPC test monitor.

B. Test Sequence:

1. Record serial and model numbers, and other pertinent data from the instruments, prior to performing any disassembly or removing the sensor from its thermowell.

2. Remove the sensor from the thermowell and determine the as-found condition of the spacer-tube (how loose, whether or not lock-tite on threads, etc.). If the spacer-tube was not tight, mark the as-received position, then tighten the tube.

3. Connect air supply and test instrumentation to the switch to simulate installed configuration (approximately 60 psig clean, dry air through 1/4 in. tubing and 0.028 in. orifice). Connect test instrumentation to provide continuous recording of air pressure at sensor after the orifice, bath temperature (2 channels -- one in a well, and one in the bath) and time.

4. Perform a calibration of the switch in its thermowell using the attached calibration procedure. Set the switch @ 200 $\pm$ 2°F. This calibration is to remain in effect for the subsequent tests.

5. Perform setpoint tests to measure setpoint and reset sensitivity to the following parameters. The attached test procedure should be used to determine the trip and reset points.

   a. With the sensor installed in the thermowell, check the trip and reset point under the following conditions: (60 psig air supply, slow rate of temperature change (e.g. 1°F/minute)). Remove the sensor from the thermowell and insert it directly in the bath, and repeat the trip and reset test. Repeat the above cycle 2 additional times to check for changes in trip and reset points.

   b. With the sensor installed in its thermowell under varying rates of temperature change (approximately 2,4, 6, 10, 15

and 20°F/minute, with 60 psig air supply pressure).

c. With the sensor installed in its thermowell, with a slow rate of temperature change (~ 1°F/min.), with various air supply pressures (55 and 65 psig).

d. With the sensor installed in its thermowell, with slow rate of temperature change (~ 1°F/min.), 60 psig air pressure, determine the effect of vibration vs. static conditions on the setpoint.

e. With the sensor installed in its thermowell, with a slow rate of temperature change (~ 1°F/min.), 60 psig air pressure, determine the effect of a change in ambient air temperature of approximately ± 20°F on the setpoint.

f. With the sensor installed in its thermowell and the bath temperature near, but just below the switch setpoint, determine the switch response to a rapid reduction in temperature (approximately 10°F in 1 minute).

g. Determine the effect of tightness of the setscrew used to attach the sensor in the thermowell on trip/reset point.

6. Determine the effect of spacer-tube looseness by returning the tube to the position noted in step B.2. If the tube is not loose, then loosen it until it can be easily moved by light finger pressure. Install the switch in its thermowell and recalibrate it using the attached procedure. Check the trip and reset points (at 1°F/minute, 60 psig air) with the sensor inserted in the thermowell and with the sensor inserted directly in the bath, as performed in B.5.a above. Perform each test a minimum of 3 times.

<u>Phase II.</u>

Testing will consist of analysis work on 7 temperature switches to determine the cause of failure. The test method will be determined after the Phase I work is complete.

<u>CALCON REPRESENTATIVE</u>

California Control Company (CALCON)

Gary Hazelitt
1334 Callens Road
Ventura, CA 93003
(805) 650-1597

Mr. Gary Hazelitt was on site (VEGP) and did some initial testing and instructed site personnel on proper calibration methods. He is a good source for information on these switches.

92 PROJECT 062686

ATTACHMENT 1

TEST PROCEDURE FOR SETTING HIGH TEMPERATURE JACKET WATER TRIP SWITCHES (CALCON - P/N F-573-330)

1. Install temperature sensor in bath (See Temp. Bath requirements).

2. Hook-up Air Supply (60 psig thru .028 orifice and test gauge) to sensor "IN" port.

3. Heat-up Bath to temperature at which sensors are to be set and stabilize.

4. Set temperature switch to trip by slowly turning split ring clockwise while watching pressure gauge. While adjusting or checking trip temperature setting, lightly tap continuously on the side of the sensor. This simulates engine vibration and will give a more accurate setting. When switch begins to trip, the pressure gauge will drip. The temperature sensor is considered tripped when gauge drops to 20 psi.

5. Cool temp. bath and note that temp. sensor resets (40 psi on gauge) by 10°F below setpoint. Pressure gauge must reset to within 1 psi of supply pressure by 20°F below setpoint.

6. Reheat bath (always starting 20°F below setpoint) and check trip setting. Readjust as required to desired setting. A ± 2°F tolerance is acceptable.

7. Recheck settings until setting within tolerance is achieved two consecutive times.

ATTACHMENT 1, PAGE 2

TEMPERATURE BATH REQUIREMENTS

1. To test temperature switches accurately, a bath must have heating, cooling and circulating abilities.

2. Two Temp. switche thermowells are required submerged 3" into the water.

3. Install Temp. Sensor in one well and a thermometer in the other. (Seal thermometer in well at the top to suppress heat loss. Thermometer should not touch sides or bottom of well).

4. A 60 psi supply pressure thru a 0.028 ± .001 orifice thru a test gauge to the sensor is required.

TEMPERATURE SENSORS

Transamerica Delaval Inc.
Engine and Compressor Division

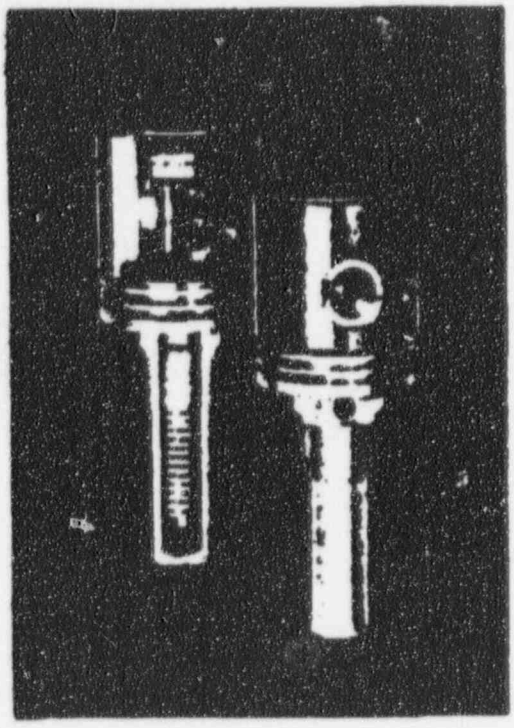
PART NUMBER(S)

F-573-330

FALCON

PNEUMATIC

SECTION A
RANGE 0-400°F



DESCRIPTION• This line of temperature sensors is designed around Falcon's unique solid phase thermal expansion cells. Model variations consist of rising temperature trip (N.C.), falling temperature trip (N.O.) and extended element units. Optional cadmium plated carbon steel or stainless steel wells are offered in the standard length units. Minimum well thickness is 0.053". Extended element sensors have 304 stainless steel wells with 0.119" wall thickness. Being small in diameter, the sensing element stack permits installation in small diameter wells. The stroke vs. temperature ratio is linear over the full 0-400°F temperature range and the element is sized to give an accurate 100°F setting change for each full turn of the adjusting device. This type of expansion element has more inherent accuracy and linearity than the bi-metal disk type, and it cannot suffer rupture and loss of fluid such as may occur in the filled bellows elements. Actual element hysteresis is approximately 2 to 3°F, although service and installation factors such as wells, heat transfer fluids, rate of temperature change, etc. will impose other time and temperature gradients. The trip point may be effected by supply air pressure changes (approx. 0.3°F /Δ psi). Units must be installed in a thermo-well and if the unit is positioned within 45° of vertical, Dow 710 heat transfer fluid may be used. This material has a gel time of approximately 18 months at 400°F and appreciably longer at lower temperatures. This material must not be allowed to harden in the well and other heat transfer greases should not be used.

APPLICATION• These temperature sensors may be used as a detector in any media system compatible with the temperature range of the sensor and the material and pressure limitations of the wells. Extended element sensors are useful in reaching the center region of pipe fluid flows. Typical uses are on engines, gas compressors, and in the process industry as high and low limit transducers. Data is available relating to pressure and velocity ratings. Special wells for very high pressure service can be supplied.

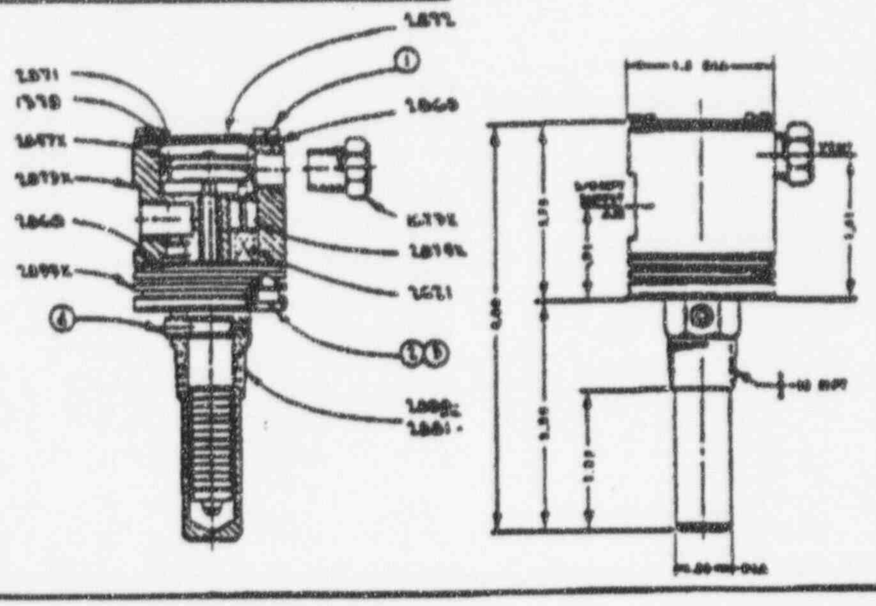
ORDERING INFORMATION• Use the table on the right and the outline details on the back of this sheet. Unless otherwise specified, sensors will be shipped factory set and tested at 300°F (static temperature conditions) with an applied 35 psi supply air. Upon request, special temperature settings will be made at no additional cost. A small vial of Dow 710 heat transfer fluid is supplied with each sensor.

	MODEL NO. NORMALLY OPEN	WELL MAT'L	PIPE TH'D NPT	INSERTION LENGTH "L"	MODEL NO. NORMALLY CLOSED
STD LENGTH	A2830 C	STEEL	3/8	1.37	A2831 C
	A2830 S	30365	3/8	1.37	A2831 S
EXTENDED LENGTH	A2830-M2	30488	1/2	2.00	A2831-M2
	-M3	30488	1/2	3.00	-M3
	-M4	30488	1/2	4.00	-M4
	-M5	30488	1/2	5.00	-M5
	A3500-M2	30488	3/4	2.00	A3501-M2
	-M3	30488	3/4	3.00	-M3
	-M4	30488	3/4	4.00	-M4
	-M5	30488	3/4	5.00	-M5

NORMALLY CLOSED STANDARD LENGTH

P/N	DESCRIPTION	QTY
16792	VENT SEAL	1
2621	SPRING	1
2864X	ELEMENT SUB-ASSY	1
2867X	ADJUSTER SUB-ASSY	1
2860	GASKET	2
2871	LOCK SLEEVE	1
2872	NAMEPLATE	1
2874X	BODY SUB-ASSY	1
2876X	POPPET SUB-ASSY	1
2882	VIAL	1
1378	O-RING	1

AS SPECIFIED		
2880	WELL - STANDARD	1
2881	WELL - STAINLESS	



NORMALLY OPEN STANDARD LENGTH

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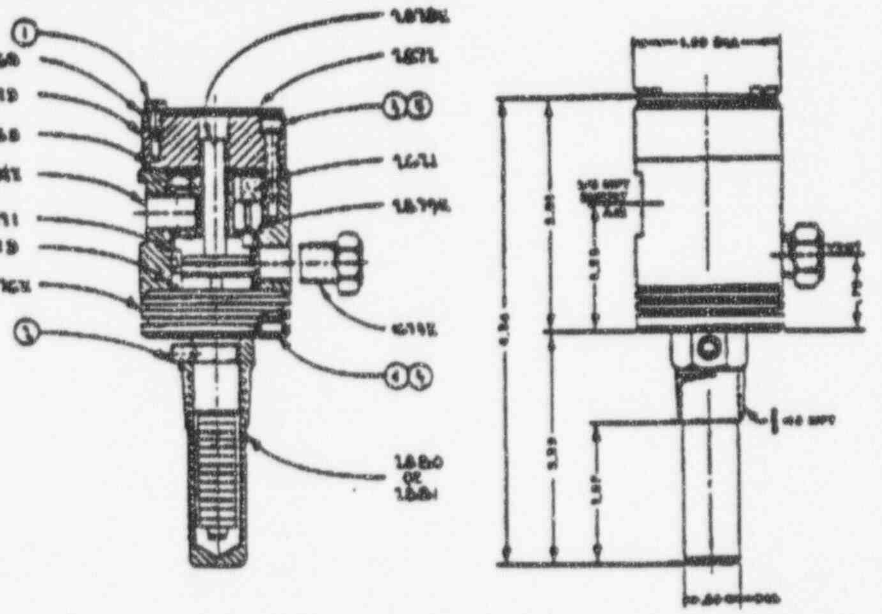
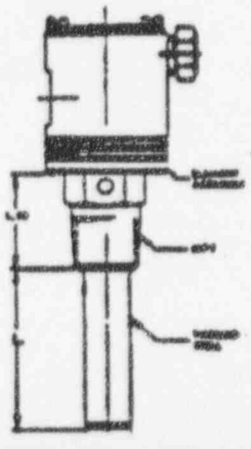
2860	GASKET	2
2871	LOCKING SLEEVE	1
2872	NAMEPLATE	1
2874X	BODY SUB-ASSY	1
2876X	POPPET ASSY	1
2878X	ADJUSTER SUB-ASSY	1
2873	CAP	1
2882	VIAL	1
1378	O-RING	1

AS SPECIFIED		
2880	WELL - STANDARD	1
2881	WELL - STAINLESS	



EXTENDED ELEMENT SENSORS

PART NUMBER	R.C. ELEMENT	THERMO WELL	"L"	N.P.T.
A2030-02	2061-02	2130-2	2.0	1/2-14 NPT
-03	-03	-3	3.0	
-04	-04	-4	4.0	
-05	-05	-5	5.0	
A2080-02	2060-02	2136-2	2.0	3/4-14 NPT
-03	-03	-3	3.0	
-04	-04	-4	4.0	
-05	-05	-5	5.0	



DIMENSIONS AND PARTS ARE AS GIVEN ON STANDARD UNITS ABOVE EXCEPT AS SHOWN. WELLS ARE MACHINED FROM 304 STAINLESS STEEL. NOMINAL WALL THICKNESS IS 0.1[illegible].

HEAVY WALL AND FLANGED WELLS ARE AVAILABLE FOR EXTRA HIGH PRESSURE OR HIGH VELOCITY SERVICE. CONSULT FACTORY FOR AVAILABILITY.

THE FACTORY ATTEMPTS TO MAINTAIN AN ADEQUATE STOCK OF THE POPULAR ITEMS. IT IS SUGGESTED, HOWEVER, THAT A STOCK ORDER BE MADE IF DELIVERY IS CRITICAL.