AMERACE LTD.

77 WEST BEAVER CREEK ROAD
RICHMOND HILL, ONTARIO
L4B 3A7 CANADA

TEST REPORT NUMBER 00-12
PROJECT NUMBER D-17

NO. OF PAGES 11
DATE August 8, 2000

REPORT OF TEST ON
FAA-L-830-6

TA200666- 01

200W 6.6/6.6A 60Hz

Series Isolating Transformer

for

AMERACE
A division of Thomas & Betts

Performed by:
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STATEMENTS MADE AND DATA SHOWN , ARE TO THE BEST OF OUR KNOWLEDGE AND BELIEF, CORRECT AND WITHIN THE USUAL LIMITS OF COMMERCIAL TESTING PRACTICES.

DESIGN SPECIFICATION AS PER E-29E-6A
DATED June 20, 2000
(TRANSFORMERS - CORE & COIL DESIGN HISTORY FILE)

ADMINISTRATIVE DATA

1.0	**PURPOSE OF TEST**	For compliance to FAA-AC #150/5345–47A dated 12/09/87, classification L830-6, on transformers encapsulated with Sarlink 4165BLK and using a bobbin.
2.0	**MANUFACTURER AND SPONSOR**	Amerace
3.0	**TYPE, PART OR MODEL NO.**	TA200666-01
	3.1 MATING PARTS	FAA-type L-823 Connectors
4.0	**DRAWING, SPECIFICATION OR EXHIBIT**	FAA Spec. (L-830/831)
5.0	**QUANTITY OF ITEMS TESTED**	Three (3)
6.0	**SECURITY CLASSIFICATION OF ITEMS**	Classified
7.0	**DATE(S) TEST CONDUCTED**	August 08, 2000 to September 07, 2000
8.0	**PLACE(S) TEST CONDUCTED**	Amerace, Richmond Hill, Ontario
9.0	**DISPOSITION OF SPECIMENS**	Store until Certification is received but not less than 90 days
10. 0	**REFERENCES**	FAA-AC 150/5345-47A
11.0	**REPORT DISTRIBUTION**	N/A

12.0 TEST EQUIPMENT

Sine Wave Power Sources:

(1) Elgar Model 1001A - 1000 V.A. AC power source c/w series 400V sine wave generator for 50 and 60 Hz tests - S.R. #503 (WC 069), calibrated September 1999.

(2) Powerstat Models 236B 240 VAC 10 Amp and 136B 120 VAC 22 Amp AC variacs.

Metering:

(3) Multiamp Pentameter, Model 235110, Mod. 001 Ammeter/Voltmeter - S.R. #4779 (WC 069), calibrated November 1999.

(4) Weston Model 904 AC Ammeter, S.R. #12853, calibrated January/February 2000.

(5) Associated Research Model 05220A portable DC Hipot 0 - 15 kVDC, S.R. #2829, calibrated February 2000.

(6) Ohmmeter Valhalla Scientific model 4100 ATC S.R. #8-3552. This meter incorporates Automatic Temperature Compensation, which gives a direct measurement of resistance values referenced to 20°C ambient, calibrated February 2000.

Load Bank:

(7) Dale type NH non-inductive resistor, (WC 069).

(8) External load combination using Ohmite Model Power Rib resistor.

Go/No-Go Gauges:

(9) Hilco gauges, S.R. #39993, calibrated March 2000.

Notes: Items 1, 3, and 7 used only on Characteristics Test, Section 4.2.1. and 4.2.3.1
Items 2, 4, 5, and 9 used only on Insulation Resistance Tests, Section 4.2.3.
Items 2, 4, 6, and 8 used only on Temperature Rise Tests, Section 4.2.4.

13.0 TESTS PERFORMED

All tests performed in the following order as per FAA-AC #150/5345-47A Advisory.

Cl. 4.2.1 Electrical Characteristic Test
Cl. 4.2.2 Shock Test
Cl. 4.2.3 Insulation Resistance Test (20 cycles)
Cl. 4.2.4 Temperature Rise Test

14.0 CONCLUSION

1.0 Electrical and physical analysis of the three transformers showed that they met all the requirements of the FAA Advisory Circular 150/5345-47A, specifically as follows:

2.0 Electrical characteristics tests showed that all samples were within the tolerances specified.

3.0 Shock tests showed virtually no change in the output current.

4.0 Insulation resistance tests showed a minimum of 150000 megohms at 15 kVDC, which is 200 times the specified minimum value for the primary hot test.

5.0 Temperature rise tests showed a maximum of 48.3°C rise, which is within the 55°C maximum allowed.

15.0 RECOMMENDATION

Based on the positive results from the design tests, production release is warranted upon receiving the FAA certification from Intertek Testing Services (ITS).

Cl. 4.2.1 Characteristic Test

The transformer samples were operated in air at room temperature with rated load connected the secondary until the transformer windings had reached normal operating temperature (minimum of 6 hours) at which time the following measurements were taken.

		Measured Values For Sample #			
	UNIT	**1**	**2**	**3**	**SPEC.**
Pri. Voltage Rated Load	V AC	34.8	34.81	34.82	--
Pri. Current Rated Load	AmpAC	6.6	6.6	6.6	6.6
Sec. Voltage Rated Load	V AC	32.1	32.12	32.08	--
Sec. Current Rated Load	AmpAC	6.563	6.565	6.561	6.53-6.67
Efficiency Rated Load	%	92.	91.78	91.57	Min. 90
Load Resistance	Ohms	4.877	4.877	4.877	4.82
Sec. Voltage Open Circuited	V AC	55.79	56.43	55.83	Max. 100
Sec. Current Short Circuited	AmpAC	6.671	6.654	6.661	6.6 - 7.1
Power Factor	%	99.4	99.5	99.4	Min. 95

Note: No compensation for meter-power consumption has been applied to the reading as the Pentameter's current transformers provide a negligible burden to the test circuit.

Cl. 4.2.2 Shock Test

The shock test was comprised of a) Drop Test and b) Lead Rigidity Test.

a) **Drop Test** : The transformer samples were dropped from a height of 6 feet (2 meters) onto a smooth hardwood floor; once on the bottom corner and once on the case side.

b) **Lead Rigidity Test** : Each lead of the transformer samples was secured in a clamp fastened to a support elevated a distance in excess of the length of the lead and then the transformer was released for a free fall from the clamp elevation (once for each lead).

The samples were examined and no visible damage was evident to either the transformer case or the attaching leads. A test of the secondary current was repeated and the results are recorded in the table below for comparison..

Sample #	**Before (Amp AC)**	**After (Amp AC)**	**Change (%)**	**Spec. (Max. %)**
1	6.563	6.565	0.03	1
2	6.565	6.566	0.02	1
3	6.561	6.563	0.03	1

Cl. 4.2.3 Insulation Resistance Test

4.2.3.1 Mating Connectors

Mating connectors were checked using "go" and "no-go" gauges conforming to the requirements of the FAA Advisory Circular AC 150/5345 26B change 2 dated 8/3/82, L823 plug and receptacle cable connectors. All mating connectors were within specification tolerances. The mating connectors were installed on each of the transformer samples without the use of tape, and left in place for 20 continuous cycles. Twenty cycles was comprised of heating , water immersion testing and soaking.

4.2.3.2 Heating Cycle

The transformer samples were operated for a minimum of 6 hours in air at room temperature with rated current flowing in the primary coil and with the secondary coil open circuited.

4.2.3.3 Water Immersion Test

Immediately following the heating cycle the transformers with the mating connector test harness' installed were completely submerged in a grounded water tank at room temperature. Within 3 minutes of the interruption of the heating cycle, the insulation resistance of each coil and the lead assembly was calculated based on the measurement of the leakage current with the test DC voltage applied per table 2 of the FAA Spec. The results are recorded below under "After Heating Cycle" .

4.2.3.4 Soaking Cycle

Following immersion test , the transformers with mating connectors were soaked in the grounded tank of water at room temperature for a minimum of 12 hours. After which , the insulation resistance calculation was repeated as specified in paragraph 4.2.3.5. The results are recorded below under "After Soaking Cycle".

Cl. 4.2.3 Insulation Resistance Test (Cont'd)

4.2.3.5 **Resistance Measurement**

Each coil was tested for a period of 1 minute with the specified voltage as follows:

Primary test voltage - 15 kV DC
Secondary Test Voltage - 5 kV DC

SAMPLE #1

	PRIMARY				**SECONDARY**			
	After Heating Cycle		After Soaking Cycle		After Heating Cycle		After Soaking Cycle	
Cycle #	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)
1	0.1	150000	0.1	150000	0.1	50000	0.1	50000
2	0.1	150000	0.1	150000	0.1	50000	0.1	50000
3	0.1	150000	0.1	150000	0.1	50000	0.1	50000
4	0.1	150000	0.1	150000	0.1	50000	0.1	50000
5	0.1	150000	0.1	150000	0.1	50000	0.1	50000
6	0.1	150000	0.1	150000	0.1	50000	0.1	50000
7	0.1	150000	0.1	150000	0.1	50000	0.1	50000
8	0.1	150000	0.1	150000	0.1	50000	0.1	50000
9	0.1	150000	0.1	150000	0.1	50000	0.1	50000
10	0.1	150000	0.1	150000	0.1	50000	0.1	50000
11	0.1	150000	0.1	150000	0.1	50000	0.1	50000
12	0.1	150000	0.1	150000	0.1	50000	0.1	50000
13	0.1	150000	0.1	150000	0.1	50000	0.1	50000
14	0.1	150000	0.1	150000	0.1	50000	0.1	50000
15	0.1	150000	0.1	150000	0.1	50000	0.1	50000
16	0.1	150000	0.1	150000	0.1	50000	0.1	50000
17	0.1	150000	0.1	150000	0.1	50000	0.1	50000
18	0.1	150000	0.1	150000	0.1	50000	0.1	50000
19	0.1	150000	0.1	150000	0.1	50000	0.1	50000
20	0.1	150000	0.1	150000	0.1	50000	0.1	50000
Spec.	20	750	7.5	2000	17	300	6.7	750

Note: All Readings of the Leakage current that were below or equal to 0.1µA were recorded as 0.1µA.

Cl. 4.2.3 Insulation Resistance Test (Cont'd)

SAMPLE #2

	PRIMARY				SECONDARY			
	After Heating Cycle		After Soaking Cycle		After Heating Cycle		After Soaking Cycle	
Cycle #	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)
1	0.1	150000	0.1	150000	0.1	50000	0.1	50000
2	0.1	150000	0.1	150000	0.1	50000	0.1	50000
3	0.1	150000	0.1	150000	0.1	50000	0.1	50000
4	0.1	150000	0.1	150000	0.1	50000	0.1	50000
5	0.1	150000	0.1	150000	0.1	50000	0.1	50000
6	0.1	150000	0.1	150000	0.1	50000	0.1	50000
7	0.1	150000	0.1	150000	0.1	50000	0.1	50000
8	0.1	150000	0.1	150000	0.1	50000	0.1	50000
9	0.1	150000	0.1	150000	0.1	50000	0.1	50000
10	0.1	150000	0.1	150000	0.1	50000	0.1	50000
11	0.1	150000	0.1	150000	0.1	50000	0.1	50000
12	0.1	150000	0.1	150000	0.1	50000	0.1	50000
13	0.1	150000	0.1	150000	0.1	50000	0.1	50000
14	0.1	150000	0.1	150000	0.1	50000	0.1	50000
15	0.1	150000	0.1	150000	0.1	50000	0.1	50000
16	0.1	150000	0.1	150000	0.1	50000	0.1	50000
17	0.1	150000	0.1	150000	0.1	50000	0.1	50000
18	0.1	150000	0.1	150000	0.1	50000	0.1	50000
19	0.1	150000	0.1	150000	0.1	50000	0.1	50000
20	0.1	150000	0.1	150000	0.1	50000	0.1	50000
Spec.	20	750	7.5	2000	17	300	6.7	750

Cl. 4.2.3 Insulation Resistance Test (Cont'd)

SAMPLE #3

	PRIMARY				SECONDARY			
	After Heating Cycle		After Soaking Cycle		After Heating Cycle		After Soaking Cycle	
Cycle #	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)	Leakage Current (µA)	Calculated Resistance (M)
1	0.1	150000	0.1	150000	0.1	50000	0.1	50000
2	0.1	150000	0.1	150000	0.1	50000	0.1	50000
3	0.1	150000	0.1	150000	0.1	50000	0.1	50000
4	0.1	150000	0.1	150000	0.1	50000	0.1	50000
5	0.1	150000	0.1	150000	0.1	50000	0.1	50000
6	0.1	150000	0.1	150000	0.1	50000	0.1	50000
7	0.1	150000	0.1	150000	0.1	50000	0.1	50000
8	0.1	150000	0.1	150000	0.1	50000	0.1	50000
9	0.1	150000	0.1	150000	0.1	50000	0.1	50000
10	0.1	150000	0.1	150000	0.1	50000	0.1	50000
11	0.1	150000	0.1	150000	0.1	50000	0.1	50000
12	0.1	150000	0.1	150000	0.1	50000	0.1	50000
13	0.1	150000	0.1	150000	0.1	50000	0.1	50000
14	0.1	150000	0.1	150000	0.1	50000	0.1	50000
15	0.1	150000	0.1	150000	0.1	50000	0.1	50000
16	0.1	150000	0.1	150000	0.1	50000	0.1	50000
17	0.1	150000	0.1	150000	0.1	50000	0.1	50000
18	0.1	150000	0.1	150000	0.1	50000	0.1	50000
19	0.1	150000	0.1	150000	0.1	50000	0.1	50000
20	0.1	150000	0.1	150000	0.1	50000	0.1	50000
Spec.	20	750	7.5	2000	17	300	6.7	750

Cl. 4.2.4 Temperature Rise Test

The transformer samples were operated in air under each of the following conditions:

a) Rated Load b) Short Circuit c) Open Circuit
with rated current connected to the primary coil for a minimum of 6 hours.

Formula for temperature rise calculation $t = (234.5 + t_1)\ \frac{(R_1 - R_o)}{R_o}$

where

t Temperature Rise (°C)
t_1 Room Temperature at the beginning of the cycle (24°C)
R_1 Resistance of the coil at the end of the test ( )
R_0 Resistance of the coil at the beginning of the test cycle ( )

Note: The R_0 and the R_1 values given in the table s below are referenced to 20°C ambient by the use of the Automatic Temperature Compensation feature incorporated in the Valhalla ohmmeter.

	Temperature Rise (°C)					
	Rated Load		**Short Circuit**		**Open Circuit**	
Sample #	**Primary**	**Secondary**	**Primary**	**Secondary**	**Primary**	**Secondary**
1	41.53	38.97	32.1	31.41	48.3	35.13
2	44.37	41.120	37.68	40.57	48.28	43.63
3	36.98	35.57	37.81	35.32	46.64	40.95
Specification Max.	55	55	55	55	55	55

		Measurements					
		Rated Load		**Short Circuit**		**Open Circuit**	
Sample #		**Primary**	**Secondary**	**Primary**	**Secondary**	**Primary**	**Secondary**
1	**R_0**	0.12287	0.14096	0.12289	0.14097	0.11881	0.12958
	R_1	0.14261	0.16221	0.13815	0.15810	0.14101	0.14719
	t	41.53	38.97	32.1	31.41	48.3	35.13
2	**R_0**	0.11821	0.12836	0.12217	0.14007	0.12219	0.14013
	R_1	0.1385	0.14878	0.13998	0.15875	0.14501	0.16378
	t	44.37	41.12	37.68	40.57	48.28	43.63
3	**R_0**	0.12296	0.14215	0.11903	0.13037	0.12295	0.14215
	R_1	0.14055	0.16171	0.13644	0.14818	0.14516	0.16467
	t	36.98	35.57	37.81	35.32	46.64	40.95

Cl. 4.2.4 Temperature Rise Test (Cont'd)

A) Rated Load : The transformer samples were connected as per diagram below.

B) Short Circuit : The secondary terminals were shorted together on each transformer.

C) Open Circuit : The secondary terminals were not connected

NOTE: The transformers were powered with a variable power supply that was connected to a 60Hz line.