

FUGRO TECHNICAL SERVICES LIMITED

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MaterialLab

REPORT ON FIXED INDUCTOR

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Client Ref. : --
Report No. : 013715ST20464(1)
Date : 26 September 2002

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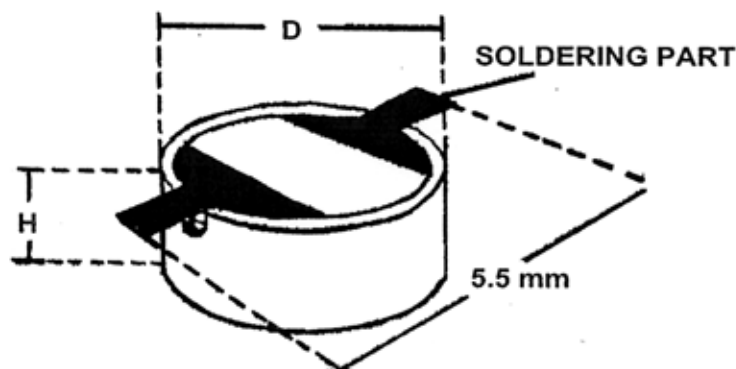
1.0 Introduction

Fugro Technical Services Limited, MaterialLab Division was commissioned by the client, Climax Industrial Co., Ltd. to conduct a series of tests for the fixed inductors in accordance with Client's specification.

The test fixed inductors were received by MaterialLab on 22 April 2002 and given Lab. Sample I.D. : ST20464/1B-80B.

2.0 Laboratory Information

Date Tested : 21 May to 24 July 2002
Test Item : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.



Test Procedure : In accordance with Client's specifications for fixed inductor (Voltage Step-up Coil)

3.0 Test Results

The summary test results and individual test results are shown on the page 2 and page 3 to 11 for this report respectively.

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SUMMARY TEST REPORT ON FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/1B-80B
Date Received : 22 April 2002
Date Test Started : 21 May 2002
Date Test Completed : 23 July 2002
Test Method : In accordance with client's specification

Test Results

Test Item	Lab. Sample I.D.	Maximum Change in Inductance (%)		Client's Specification	Results
Temperature Characteristics Test	ST20464/1B-10B	-0.4		$\leq \pm 5\%$	Comply
Humidity Characteristics Test	ST20467/11B-20B	-4.7		$\leq \pm 10\%$	Comply
Heat Resistance Test	ST20464/21B-30B	-1.9		$\leq \pm 10\%$	Comply
Thermal Shock Test	ST20464/31B-40B	-2.1		$\leq \pm 10\%$	Comply
Solderability Test	ST20464/41B-50B	-2.8		The terminal shall be as least 90% cover with solder	Comply
Resistance to Soldering Heat Test	ST20464/51B-60B	-2.9		There shall not be case deformation or change in appearance	Comply
Vibration Test	ST20464/61B-70B	-4.2		There shall not be case deformation or change in appearance	Comply
Shock Test	ST20464/71B-75B	After dropped onto wood	+0.1	There shall not be case deformation or change in appearance	Comply
		After dropped onto concrete	-2.4		
Substrate Bending Test	ST20464/76B-80B	-2.2		$\leq \pm 5\%$	Comply

Remark : This report is a supplement to test report no. 013715ST20464.

Checked by : Wong Chiu Date : 27.9.2002 Certified by : Gary Winstanley Date : 27/9/02

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REPORT ON TEMPERATURE CHARACTERISTICS TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/1B-10B
Date Received : 22 April 2002
Date Test Started : 21 May 2002
Date Test Completed : 28 May 2002
Test Method : In accordance with client's specification of fixed inductor
with modification : --
Inductors were subjected to -20°C to 85°C for 30 min each.
The values were measured at 25°C
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Specification
	Before Test	After Test		
ST20464/1B	5.942	5.943	0.0	≤ ± 5%
ST20464/2B	6.978	6.947	-0.4	
ST20464/3B	6.963	6.962	0.0	
ST20464/4B	5.560	5.552	-0.1	
ST20464/5B	5.935	5.924	-0.2	
ST20464/6B	6.020	6.010	-0.2	
ST20464/7B	5.089	5.089	0.0	
ST20464/8B	6.774	6.781	0.1	
ST20464/9B	6.353	6.341	-0.2	
ST20464/10B	6.091	6.083	-0.1	

Remarks : 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

Checked by : geachan Date : 27-9-2002 Certified by : Gary Winstanley Date : 27/9/02



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REPORT ON HUMIDITY CHARACTERISTICS TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/11B-20B
Date Received : 22 April 2002
Date Test Started : 21 May 2002
Date Test Completed : 18 June 2002
Test Method : In accordance with client's specification of fixed inductor : --
Inductors were subjected to 90 to 95% RH at $60 \pm 2^\circ\text{C}$ for
500 \pm 8 hours. Measurements were made after 2 hours stabilization
at room temperature
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Observation	Specification	
	Before Test	After Test			Change in Inductance (%)	Observation
ST20464/11B	5.685	5.589	-1.7	No deformation or change in appearance	$\leq \pm 10\%$	There shall not be case deformation or change in appearance
ST20464/12B	5.377	5.358	-0.4			
ST20464/13B	5.025	5.032	0.1			
ST20464/14B	6.021	6.006	-0.2			
ST20464/15B	6.005	5.992	-0.2			
ST20464/16B	6.421	6.120	-4.7			
ST20464/17B	5.375	5.357	-0.3			
ST20464/18B	6.641	6.631	-0.2			
ST20464/19B	5.971	5.938	-0.6			
ST20464/20B	5.724	5.719	-0.1			

Remarks 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

Checked by : W. C. C. Chan Date : 27.9.2002 Certified by : Gary Winstanley Date : 27/9/02



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REPORT ON HEAT RESISTANCE TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/21B-30B
Date Received : 22 April 2002
Date Test Started : 21 May 2002
Date Test Completed : 18 June 2002
Test Method : In accordance with client's specification of fixed inductor : --
Inductors were be subjected to $85 \pm 2^\circ\text{C}$ for 500 ± 8 hours
Measurements were made after 2 hours stabilization at room temperature
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Observation	Specification	
	Before Test	After Test			Change in Inductance (%)	Observation
ST20464/21B	5.772	5.764	-0.1	No deformation or change in appearance	$\leq \pm 10\%$	There shall not be case deformation or change in appearance
ST20464/22B	6.527	6.490	-0.6			
ST20464/23B	5.897	5.830	-1.1			
ST20464/24B	6.470	6.426	-0.7			
ST20464/25B	6.955	6.931	-0.3			
ST20464/26B	6.818	6.777	-0.6			
ST20464/27B	6.269	6.249	-0.3			
ST20464/28B	6.911	6.783	-1.9			
ST20464/29B	5.169	5.127	-0.8			
ST20464/30B	5.593	5.581	-0.2			

Remarks 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

Checked by : W. C. Chan Date : 27-9-2002 Certified by : Gary Winstanley Date : 27/9/02



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REPORT ON THERMAL SHOCK TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/31B-40B
Date Received : 22 April 2002
Date Test Started : 21 May 2002
Date Test Completed : 13 June 2002
Test Method : In accordance with client's specification of fixed inductor
with modification : --
Inductors were subjected to 100 times of the temperature cycle of
-20°C to 85°C (30 min each) Measurements were made after 2 hours
stabilization at room temperature.
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Observation	Specification	
	Before Test	After Test			Change in Inductance (%)	Observation
ST20464/31B	6.591	6.525	-1.0	No deformation or change in appearance	$\leq \pm 10\%$	There shall not be case deformation or change in appearance
ST20464/32B	6.247	6.180	-1.1			
ST20464/33B	6.246	6.205	-0.7			
ST20464/34B	6.825	6.766	-0.1			
ST20464/35B	6.018	5.988	-0.5			
ST20464/36B	5.933	5.862	-1.2			
ST20464/37B	6.731	6.708	-0.3			
ST20464/38B	5.352	5.332	-0.4			
ST20464/39B	4.427	6.338	-1.4			
ST20464/40B	5.607	5.491	-2.1			

Remarks 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

Checked by : Korrellan Date : 27-9-2002 Certified by : Gary Winstanley Date : 27/9/02



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REPORT ON SOLDERABILITY TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/41B-50B
Date Received : 22 April 2002
Date Test Started : 23 July 2002
Date Test Completed : 24 July 2002
Test Method : In accordance with client's specification of fixed inductor : --
After fluxing, inductors were dipped in melted solder bath at
230 ± 5°C for 2 ± 0.5sec.
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Percentage of Terminal Covered with solder	Specification
	Before Test	After Test			
ST20464/41B	6.825	6.707	-1.7	100	The terminal shall be as least 90% cover with solder
ST20464/42B	6.723	6.583	-2.1	100	
ST20464/43B	6.670	6.622	-0.7	100	
ST20464/44B	6.461	6.443	-0.3	100	
ST20464/45B	6.764	6.645	-1.8	100	
ST20464/46B	6.826	6.746	-1.2	100	
ST20464/47B	5.478	5.317	-2.8	100	
ST20464/48B	6.606	6.509	-1.5	100	
ST20464/49B	6.465	6.371	-1.5	100	
ST20464/50B	6.045	6.002	-0.7	100	

Remarks : 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

Checked by : see cheun Date : 27.9.2002 Certified by : Gary Winstanley Date : 27/9/02



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REPORT ON RESISTANCE TO SOLDERING HEAT TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/51B-60B
Date Received : 22 April 2002
Date Tested : 21 May 2002
Test Method : In accordance with client's specification of fixed inductor : --
Inductors were dipped in a melted solder bath at $280 \pm 5^\circ\text{C}$ for 10 ± 0.5 sec up to 0.5mm from attachment surface
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Observation	Specification	
	Before Test	After Test			Change in Inductance (%)	Observation
ST20464/51B	6.825	6.707	-1.7	No deformation or change in appearance	$\leq \pm 10\%$	There shall not be case deformation or change in appearance
ST20464/52B	6.723	6.583	-2.1			
ST20464/53B	6.670	6.622	-0.7			
ST20464/54B	6.461	6.443	-0.3			
ST20464/55B	6.764	6.645	-1.8			
ST20464/56B	6.826	6.746	-1.2			
ST20464/57B	5.478	5.317	-2.9			
ST20464/58B	6.606	6.509	-1.5			
ST20464/59B	6.465	6.371	-1.5			
ST20464/50B	6.045	6.002	-0.7			

- Remarks 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

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REPORT ON VIBRATION TEST (LOW FREQUENCY) OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/61B-70B
Date Received : 22 April 2002
Date Tested : 23 July 2002
Test Method : In accordance with client's specification of fixed inductor : --
Motion were applied for 20 min in each of the 3 mutually perpendicular directions at a frequency of 10-120 Hz with amplitude of 1.5 mm for a period of 60 sec.
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Observation	Specification	
	Before Test	After Test			Change in Inductance (%)	Observation
ST20464/61B	6.331	6.064	-4.2	No deformation or change in appearance	$\leq \pm 5\%$	There shall not be case deformation or change in appearance
ST20464/62B	5.811	5.784	-0.5			
ST20464/63B	5.259	5.223	-0.7			
ST20464/64B	6.800	6.763	-0.5			
ST20464/65B	6.430	6.340	-1.4			
ST20464/66B	6.745	6.668	-1.1			
ST20464/67B	6.085	6.062	-0.4			
ST20464/68B	6.383	6.312	-1.1			
ST20464/69B	6.436	6.422	-0.2			
ST20464/70B	6.416	6.384	-0.5			

Remarks 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715St20464.

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REPORT ON SHOCK TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/71B-75B
Date Received : 22 April 2002
Date Tested : 23 July 2002
Test Method : In accordance with client's specification of fixed inductor : --
Inductors were dropped 3 times from a height of 1m onto a wooden board
Inductors soldered on 50g weight jig were dropped 3 times from a height of 75cm onto a concrete
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)			Change in Inductance (%)		Observation	Specification
	Before Test	After Dropped onto Wood	After Dropped onto Concrete	After dropped onto Wood	After Dropped onto Concrete		
ST20464/71B	6.377	6.369	6.363	-0.1	-0.2	No deformation or change in appearance	There shall not be case deformation or change in appearance
ST20464/72B	6.421	6.419	6.381	0	-0.6		
ST20464/73B	5.496	5.501	5.462	+0.1	-0.6		
ST20464/74B	5.526	5.530	5.499	+0.1	-0.5		
ST20464/75B	6.075	6.072	5.930	0	-2.4		

Remarks 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

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REPORT ON SUBSTRATE BENDING TEST OF FIXED INDUCTOR**Information Supplied by Client**

Client : Climax Industrial Co., Ltd.
Project : Testing of Fixed Inductor
Sample Description : Fixed Inductor (Voltage Step-up Coil)
Model No. : CL3320T-6B/35(10)
Diameter : 3.3 mm
Height : 2.0 mm
Length : 5.5 mm
Width : 0.85 mm max.

Laboratory Information

Lab. Sample I.D. : ST20464/76B-80B
Date Received : 22 April 2002
Date Tested : 23 July 2002
Test Method : In accordance with client's specification of fixed inductor : --
A load were applied to inductors soldered on a PCB until the PCB was bent to 2mm and then returned back to original position
Measuring Equipment : Dual Display LCR Meter
Manufacturer : AVO
Model No. : B131
Serial No. : 01061088
Test Frequency : 1 kHz

Test Results

Lab. Sample I.D.	Inductance (mH)		Change in Inductance (%)	Specification
	Before Test	After Test		
ST20464/76B	6.076	6.018	-1.0	≤ ± 5%
ST20464/77B	5.276	5.232	-0.8	
ST20464/78B	6.897	6.853	-0.6	
ST20464/79B	6.647	6.593	-0.8	
ST20464/80B	5.462	5.340	-2.2	

Remarks : 1.) The test results relate only to the sample tested.
2.) The test results **comply** with the requirement of client's specification of fixed inductor.
3.) This report is a supplement to test report no. 013715ST20464.

Checked by : W. C. Lee Date : 27-9-2002 Certified by : Gary Winstanley Date : 27/9/02