

# Cancelled

Title: TRANSFORMERS AND INDUCTORS, POWER,  
HIGH RELIABILITY,SPACE USE,  
DETAIL SPECIFICATION FOR  
(NASDA 2110/A116 TYPE)

Document number: JAXA-QTS-2110/A116E

Cancellation date: 1 October 2023

JAXA  
JAPAN AEROSPACE EXPLORATION AGENCY

Registration No. 1218

JAXA-QTS-2110/A116E  
13 December 2019

Superseding  
JAXA-QTS-2110/A116D  
Cancelled  
13 December 2019

TRANSFORMERS AND INDUCTORS, POWER,  
HIGH RELIABILITY, SPACE USE,  
DETAIL SPECIFICATION FOR  
(NASDA 2110/A116 TYPE)

Prepared and Established by Tamura Corporation

Issued by Japan Aerospace Exploration Agency

This document is the English version of JAXA QTS/ADS which was originally written and authorized in Japanese and carefully translated into English for international users. If any question arises as to the context or detailed description, it is strongly recommended to verify against the latest official Japanese version.

The release date of the English version of this specification: June 25, 2021

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Revision Log				
Rev.	Date	Changes		
NC	30 Sep. 2005	Original		
A	7 Feb. 2008	<p>(1) Extended the qualification coverage regarding terminal strength. (Tables 2 and 3)</p> <ul style="list-style-type: none"> <li>• PTFE lead wire over AWG18: 13.7N max. → 19.6N max.</li> <li>• Direct wiring wire over <math>\phi 1.14\text{mm}</math>: 9.8N max. → 19.6N max.</li> </ul> <p>(2) Corrected marking items and abbreviation rule of markings in accordance with the actual markings. (paragraph 3.2)</p> <p>(3) Changed wiring ratio as follows to be consistent with the qualification coverage. (Table 4)</p> <ul style="list-style-type: none"> <li>• <math>(9-10)/(1-2) = 2.525 \pm 3\% \rightarrow 2.475 \pm 3\%</math></li> </ul>		
B	11 Dec. 2008	<p>(1) Extended the qualification coverage regarding operating voltage and dielectric withstanding voltage as follows.</p> <p>Operating voltage: 175Vpeak max. → 250Vpeak max.</p> <p>Dielectric withstanding voltage: AC500V max. → AC700V max. (Table 1)</p> <ul style="list-style-type: none"> <li>• Output power: 97VA → 100VA (Table 2)</li> <li>• Operating voltage: 175Vpeak max. → 250Vpeak max. (Except 175Vpeak max. for coil)</li> <li>• Added electric field intensity</li> <li>• Dielectric withstanding voltage: AC500V max. → AC700V max. (Table 3)</li> <li>• Dielectric withstanding voltage: At barometric pressure: AC500V → AC700V At reduced pressure: AC300V → AC320V</li> <li>• Insulation resistance: DC100V → DC500V (Table 4)</li> <li>• Winding ratio: <math>(3-4)/(1-2) = 1.500 \pm 3\% \rightarrow 2.250 \pm 3\%</math>  <math>(5-6)/(1-2) = 0.800 \pm 3\% \rightarrow 1.000 \pm 3\%</math>  <math>(7-8)/(1-2) = 1.300 \pm 3\% \rightarrow 1.750 \pm 3\%</math>  <math>(9-10)/(1-2) = 2.475 \pm 3\% \rightarrow 3.540 \pm 3\%</math>  <math>(11-12)/(1-2) = 1.300 \pm 3\% \rightarrow 2.000 \pm 3\%</math>  <math>(13-14)/(1-2) = 0.300 \pm 4\% \rightarrow 0.500 \pm 4\%</math></li> <li>• Inductance: 5.0mH → 2.3mH</li> <li>• DC resistance: <math>(1-2) = 0.05\Omega \text{ max.} \rightarrow 0.03\Omega \text{ max.}</math>  <math>(7-8) = 0.30\Omega \text{ max.} \rightarrow 0.25\Omega \text{ max.}</math>  <math>(11-12) = 0.55\Omega \text{ max.} \rightarrow 0.50\Omega \text{ max.}</math></li> <li>• Output: 97VA → 100VA</li> <li>• Change in test circuit: Load between 9 and 10: 500<math>\Omega</math> → 10k<math>\Omega</math>  Load between 11 and 12: 300<math>\Omega</math> → 4k<math>\Omega</math></li> </ul> <p>(2) Thermal shock: Changed temperature at 3rd step (Table 3) 115°C → 130°C (Maximum operating temperature)</p>		

Rev.	Date	Changes
C	3 July 2017	Paragraph 1.1: Scope: Added “The products per this specification are manufactured...or Wakayanagi Tamura Corporation (Kurihara city of Miyagi)” Paragraph 3.2: Externals, Construction, Dimensions, Marking and Mass: Added “Additionally, manufacture line identification letter “W” is added to...” and a marking example in (4).
D	1 Apr. 2019	Paragraph 1.1: Scope: Deleted the description about Tamura Corporation (Sakado city of Saitama) due to unification of the facility. Paragraph 3.2: Externals, Construction, Dimensions, Marking and Mass: ▪ Changed description due to unification of the facility. ▪ Changed manufacturer line identification letter to manufacturer line letter in the text and marking example.
E	13 Dec. 2019	Paragraph 1.1: Scope: Added “The transformers and inductors specified herein do not meet outgassing requirements.” Paragraph 3.2: Externals, Construction, Dimensions, Marking and Mass: (4) Added “and manufacture line letter”. (error corrected) Paragraph 4.5: Change to tests and inspections: Added the description about the shortening of applied time of the test voltage in insulation resistance test.

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**NASDA 2110/A116 TYPE,  
TRANSFORMERS AND INDUCTORS, POWER,  
HIGH RELIABILITY, SPACE USE,  
DETAIL SPECIFICATION FOR**

**1. GENERAL**

**1.1 Scope**

This specification establishes the detail requirements for toroidal transformers and inductors with a ferrite core (NASDA 2110/A116 type) of space use, high reliability, transformers and inductors that satisfied JAXA-2110, Transformers and Inductors, High Reliability, Space use, General Specification for. The products per this specification are manufactured in Wakayanagi Tamura Corporation (Kurihara city of Miyagi).

The transformers and inductors specified herein do not meet outgassing requirements.

**1.2 Part Number**

The part number shall be indicated in accordance with paragraph A.1.2 of JAXA-QTS-2110 as shown below. When a purchaser designates a specific part number, corresponding part number in this specification shall be stipulated in a product specification.

(Example)

NASDA<sup>(1)</sup> 2110/A116 – T000  
|  
Identification number

Note: <sup>(1)</sup> "NASDA" indicates the common part for space use and may be abbreviated to "N".

**1.3 Rating**

The rating shall be as specified in Table 1.

**Table 1. Rating**

Item	Applicable paragraph of JAXA-QTS-2110	Identification number	
		T000	T001 or subsequent
Grade	A.3.3.8	6 (open type)	
Operating ambient temperature	–	-55 to +100°C	As specified in the product specification.
Class	A.3.6.1	S (130°C)	
Operating frequency	–	50kHz	
Input voltage	–	50Vrms	
Output power	–	100VA	

## 2. APPLICABLE DOCUMENTS

Applicable documents shall be as specified in paragraph A.2.1, Appendix A of JAXA-QTS-2110.

## 3. REQUIREMENTS

Requirements shall be as follows and as specified in Section A.3, Appendix A of JAXA-QTS-2110.

## 3.1 Qualification Coverage

The qualification coverage shall be as given in Table 2.

**Table 2. Qualification Coverage**

No.	Item	Specification to be covered
1	Class (maximum operating temperature)	S (130°C) max.
2	External/internal mounting construction	Adhesion or combination of adhesion and screwing
	External dimension (mm)	φ65 x 43 <sup>H</sup> max.
	Total volume (cm <sup>3</sup> )	142.6 max.
3	Operating voltage	250V <sub>peak</sub> max. (Except 175V <sub>peak</sub> max. for coil)
	Insulation	Polyester, equivalent or better
	Electric field intensity	63.5V/mil max. (Not applicable for 175V <sub>peak</sub> and below)
4	Magnet wire diameter (mm)	φ0.1 min.
	Coating material	Polyester, equivalent or better
5	Grade	6
	Insulation, impregnation, and filling material	Epoxy impregnation
6	Construction and material of terminal	PTFE lead wire (AWG30 min.) Direct wiring wire (φ0.4mm min.)
	Terminal strength	MIL-STD-202, test method 211, test condition A PTFE lead wire: 19.6N max. (over AWG18) 13.7N max. (AWG28 to 18) 9.8N max. (AWG30 to 28 ) Direct wiring wire: 19.6N max. (over φ1.14mm) 9.8N max. (φ 0.4mm to 1.14mm)
7	Shock	MIL-STD-202, test method 213 Test conditions: 1,000G, 0.4ms, semi sine wave max.
	Vibration	MIL-STD-202, test method 204, test condition D max. MIL-STD-202, test method 214, test condition II-H max.
8	Core material	Ferrite
	Core shape	Toroidal type
9	Dielectric withstanding voltage	AC 700V max.



### 3.2 External Construction, Dimension, Marking and Mass

The externals, constructions, dimensions and mass shall be as specified in Figure 1. Marking items shall be as follows in accordance with paragraph A.3.4.1, Appendix A of JAXA-QTS-2110. If the product specification has marking requirements, marking shall be made as specified in the product specification. Marking location shall be as shown in Figure 1. Additionally, manufacture line letter “W” is added to the end of the serial number or to the location specified in the product specification.

- (1) Part number in this specification
- (2) Terminal identification (See Figure 1)
- (3) Lot identification code
- (4) Serial number and manufacture line letter

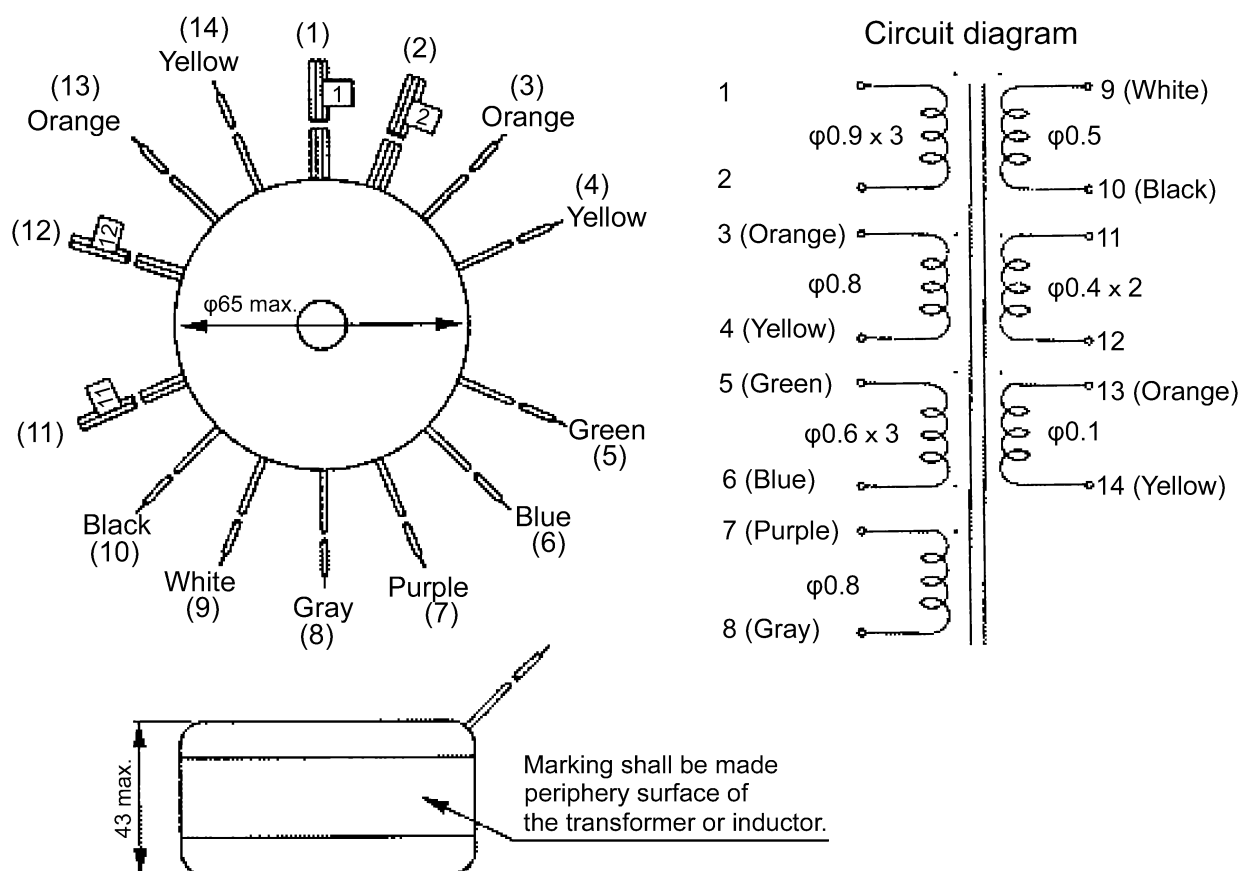
(Marking example)

Serial number        No. 1 W Manufacture line letter:  
Letter “W”: Wakayanagi Tamura Corporation

#### (5) Trademark

If the marking area on the transformer or inductor is limited, the items above may be abbreviated or omitted in the following order of precedence.

- (1) “2110/A” of the part number
- (2) Trademark



Unit: mm

- Lead wire length: 100mm min.  
AWG 18 for terminals 5, 6  
AWG 20 for terminals 3, 4, 7, 8  
AWG 24 for terminals 9, 10  
AWG 30 for terminals 13, 14  
Direct wiring wire of  $\phi 0.9$ mm x 3 for terminals 1, 2  
Direct wiring wire of  $\phi 0.4$ mm x 2 for terminals 11, 12  
Coating removed approx. 10mm at the end
- Mass: 350g max.

**Figure 1. External, Construction, Dimension, Marking and Mass<sup>(1)</sup>**

Note: <sup>(1)</sup> Figure 1 is applicable to all certified products. Externals, construction, dimensions, marking and mass of Individual product included in the qualification coverage shall be as specified in the product specification.

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3.3 Performance			
Performance requirements shall be as specified in Table 3.			
Table 3. Performance Requirements <sup>(1)</sup>			
Item	Requirement paragraph of JAXA-QTS-2110	Requirement	
Electrical characteristics	A.3.7.1	As specified in Table 4.	
Dielectric withstanding voltage	A.3.7.2	At barometric pressure: AC700V for 1 minute At reduced pressure: 1.1kPa, AC320V for 1 minute	
Interlayer withstanding voltage	A.3.7.3	100kHz, sine wave of 100Vrms applied between (1-2) for 5±0.5s	
Insulation resistance	A.3.7.4	DC500V, a) 10,000MΩ min.	
Corona discharge	A.3.7.5	N/A	
Temperature rise	A.3.7.6	30°C max. (ambient temperature: 100°C)	
Overload	A.3.7.7	Ambient temperature: 130°C – measured temperature rise	
Conductivity	A.3.7.8	As specified in Appendix A of JAXA-QTS-2110.	
Terminal strength (pull)	A.3.8.1	PTFE lead wire: 19.6N max. (over AWG18) 13.7N max. (AWG28 to 18) 9.8N max. (AWG30 to 28 ) Direct wiring wire: 19.6N max. (over φ1.14mm) 9.8N max. (φ 0.4mm to 1.14mm)	
Solderability	A.3.8.2	N/A	
Resistance to soldering heat	A.3.8.3	N/A	
Seal	A.3.8.4	N/A	
Vibration	A.3.9.1	High frequency: As specified in Appendix A of JAXA-QTS-2110. Random: As specified in Appendix A of JAXA-QTS-2110.	
Shock	A.3.9.2	Test conditions: 1,000G, 0.4ms, semi sine wave	
Thermal shock	A.3.9.3	Test condition A-1 (temperature at 3rd step: 130°C)	
Immersion	A.3.9.4	N/A	
Moisture resistance	A.3.9.5	As specified in Appendix A of JAXA-QTS-2110.	
Flammability	A.3.9.6	N/A	
Resistance to solvent	A.3.9.7	N/A	
Life	A.3.10.1	Ambient temperature: 130°C – measured temperature rise	
Note: <sup>(1)</sup> This table is applicable to all certified products. Performance of individual product included in the qualification coverage shall be as specified in the product specification.			

## 3.4 Electrical Characteristic

The electrical characteristics shall be as shown in Table 4.

**Table 4. Electrical Characteristics<sup>(1)</sup>**

Item	Rating
Operating frequency	50kHz±10%
Power supply voltage	50Vrms
Winding ratio	$(3-4) / (1-2) = 2.250 \pm 3\%$ $(5-6) / (1-2) = 1.000 \pm 3\%$ $(7-8) / (1-2) = 1.750 \pm 3\%$ $(9-10) / (1-2) = 3.540 \pm 3\%$ $(11-12) / (1-2) = 2.000 \pm 3\%$ $(13-14) / (1-2) = 0.500 \pm 4\%$
Inductance	(1-2) = 2.3mH min. at 10kHz, 1.0V
DC resistance (at 20°C)	(1-2) = 0.03Ω max., (9-10) = 1.20Ω max. (3-4) = 0.30Ω max., (11-12) = 0.50Ω max. (5-6) = 0.08Ω max., (13-14) = 4.00Ω max. (7-8) = 0.25Ω max.
Output	100VA
Polarity	Test points 1, 3, 5, 7, 9, 11, and 13 shall have the same polarity.
Test circuit	<p>The test circuit diagram illustrates the electrical setup for testing the transformer. A 50kHz sine wave oscillator is connected to the primary winding (terminals 1 and 2) of a transformer, which is supplied with 50Vrms. The secondary windings are connected to various resistors to test the winding ratios and DC resistance. The secondary windings and their corresponding resistors are: (1-2) primary, (3-4) 400Ω, (5-6) 100Ω, (7-8) 200Ω, (9-10) 10kΩ, (11-12) 4kΩ, and (13-14) 2kΩ. The diagram also shows the polarity of the terminals, with terminals 1, 3, 5, 7, 9, 11, and 13 having the same polarity.</p>

Note: <sup>(1)</sup> This table is applicable to all certified products. Electrical characteristics of individual product included in the qualification coverage shall be specified in the product specification.

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<p>4. QUALITY ASSURANCE PROVISIONS</p> <p>Quality assurance provisions shall be as specified in Section A.4, Appendix A of JAXA-QTS-2110.</p> <p>4.1 In-Process Inspection</p> <p>The in-process inspection shall be as specified in paragraph A.4.1, Appendix A of JAXA-QTS-2110.</p> <p>4.2 Qualification Test</p> <p>The qualification test shall be as specified in paragraph A.4.2, Appendix A of JAXA-QTS-2110.</p> <p>4.3 Quality Conformance Inspection</p> <p>The quality conformance inspection shall be as specified in paragraph A.4.3, Appendix A of JAXA-QTS-2110.</p> <p>4.4 Long-Term Storage</p> <p>Long-term storage shall be as specified in paragraph A.4.5, Appendix A of JAXA-QTS-2110.</p> <p>4.5 Change to Tests and Inspections</p> <p>a) Insulation Resistance</p> <p>(Standard) Insulation resistance in accordance with test method 302 of MIL-STD-202 is specified as follows. “If the instrument reading indicates that an insulation resistance meets the specified limit (2 min.), and is steady or increasing, the test may be terminated before the end of the specified period (2 min.)”</p> <p>(Shortening of test time) From the test result and verification result, it was verified that the instrument reading increases or become stable within 2 minutes from the start of voltage application. Therefore, when the above condition is met and the measurement reaches the 10-times of 10 thousand MΩ as a minimum (which is more than 100 thousand MΩ), the test may be terminated before 2-minute passes.</p> <p>5. PREPARATION FOR DELIVERY</p> <p>Preparation for delivery shall be as specified in Section A.5, Appendix A of JAXA-QTS-2110.</p> <p>6. NOTES</p> <p>Details of notes shall be as specified in Section A.6, Appendix A of JAXA-QTS-2110.</p>			