

NUMBER: 108-5294

SECURITY CLASSIFICATION:

Customer Release

# Product Specification

108-5294

## .187 Series, Sealed Connector

1. Scope :

1.1 Contents

This specification covers the requirements for product performance, test methods and quality assurance provisions of .187 Series, Sealed Connector.

The applicable product descriptions and part number are as shown in Fig. 1 :

Product Part No.	Descriptions
175087	Tab Contact (M Size), Waterproof Type
175088	Tab Contact (L Size), Waterproof Type
175090	Receptacle Contact (M Size), Waterproof Type
175091	Receptacle Contact (L Size), Waterproof Type
176143	2-Position, Cap Housing Assembly
176146	2-Position, Plug Housing Assembly

Fig. 1

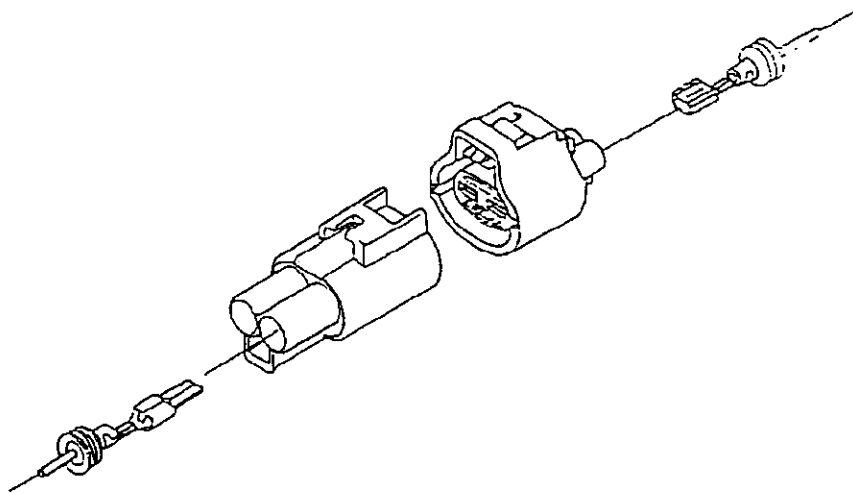


Fig. 2

					DR.	5/13 '91	SHEET OF 1	<b>AMP</b> AMP (Japan), Ltd. Kawasaki, Japan			
					Y. Kinoshita						
					CHK.	5/13 '91	13	LOC	LOC	NO.	REV.
					K. Oda		J	A	108-5294	C	
					APP.	5/14 '91	NAME				
					S. Isohata		.187 Series, Sealed Connector				
PRINT	DIST.	C	REVISDFJ00-0277-94	Y7	DR	CHK	DATE				
		B	REVISDFJ00-0277-94	Y7	DR	CHK	DATE				
		A	Released RFA-1779	Y.K	K.O	5/14/91					
		LTR	REVISION RECORD	DR	CHK	DATE					

## 2. Applicable Documents :

The following documents from a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

### 2.1 AMP Specifications :

- A. 109-5000 Test Specification, General Requirements for Test Methods
- B. 114-5126 Application Specification, Crimping of 187 Series, Water-proof Contact
- C. 501-5021 : Test Report.
- D. CM-488J : Customer Manual, 187 Series, Sealed Connector

### 2.2 Military Standard and Specifications :

MIL-STD-202 Test Methods for Electronic and Electrical Component Parts.

### 2.3 Commercial Standard and Specification :

- A. JASO D 605 Multi-Connectors for Automotives
- B. JASO D 7101 Testing Method of Molded Plastics Parts for Automobile
- C. JIS C 3406 Low-Voltage Cables for Automobile
- D. JIS D 0203 Method of Moisture, Rain and Spray Test for Automobile Parts
- E. JIS D 0204 Method of High and Low Temperature Test for Automobile Parts
- F. JIS D 1601 Vibration Testing Method for Automobile Parts
- G. JIS K 6301 Physical Testing Methods for Vulcanized Rubber
- H. JIS K 2202 Motor Gasoline

## 3. Requirements :

### 3.1 Design and Construction :

Product shall be of the design, construction and physical dimensions specified in the applicable product drawing.

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3.2 Materials:

A. Contact:

Tab and Receptacle: Brass

B. Housing:

Cap and Plug Housing: Molded Polybutylene Terephthalate (PBT)

Keying and Plate: Molded Polybutylene Terephthalate (PBT)

C. Accessories and Hardware:

Seal Ring: Silicon Rubber

3.3 Ratings:

A. Voltage Rating: 13.2 V DC

B. Current Rating: 25 A

C. Temperature Rating: -30 °C to 105 °C

3.4 Performance and Test Descriptions:

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in Fig. 3. All tests are performed at ambient temperature unless otherwise specified.

3.5 Test Requirements and Procedures Summary:

Para	Test Items	Requirements	Procedures			
3.5.0	Confirmation of Product	Product shall be conforming to the requirements of applicable product drawing and Application specification 114-5126	Visually, dimensionally and functionally inspected per applicable inspection plan.			
<b>Electrical Performance</b>						
3.5.1	Termination Resistance (Specified Current)	Wire Size		Resistance (mΩ) (max.)	Measure initial millivolt drop of contact test circuit in mated connectors. by probing between Y-Y'. See Fig. 4. Calculate Termination resistance after deducting resistance of 150 mm long wire used for wiring.	
		mm <sup>2</sup>	(AWG)			Test (A) Current
		0.5	# 20			8.25
		0.85	# 18			11.25
		1.25	# 16			14.25
		2	# 14			18.75
3	# 12	25.5				
				3.0 (Initial)		
				10.0 (Final)		

Fig. 3 (To be cont'd)

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Para	Test Items	Requirements	Procedures
3.5.2	Termination Resistance (Low Level)	3 mΩ max. (Initial) 10 mΩ max. (Final)	Subject mated contacts assembled in housing to closed circuit current of $10 \pm 0.5$ mA. at open circuit voltage of $20 \pm 1$ mV Fig. 4.
3.5.3	Insulation Resistance	100 MΩ min. (Final)	Measure by applying test potential (500V DC) between the adjacent contacts, and between the contacts and ground in the unmated connector. See Fig. 5
3.5.4	Dielectric Strength	No abnormalities such as corona and flashover shall be present.	Measure by applying test potential of 1000 V AC between the adjacent contacts, and between the contacts and ground in the mated connector for 1 minute. See Fig. 5. MIL-STD-202, Method 301
3.5.5	Current Cycling	Termination resistance (low level) 10 mΩ max. (Final)	Subject mated contacts to 300 cycles of intermittent current application of the specified intensity in Para. 3.5.1, 45 minutes ON, and 15 minutes OFF.
3.5.6	Temperature Rise vs. Current	60 °C max. under loaded specified current. Fig. 4.	Measure temperature rise by energized current, probing at wire crimp of receptacle contact. Obtain temperature rise by subtracting room temperature. AMP Spec. 109-5310
3.5.7	Current Leakage	3.5 mA max.	After exposing connector in test chamber ( $60 \pm 5$ °C, 90-95 % R. H.) for 1 hour, measure by applying DC 12 V to the circuit. See Fig. 5.

Fig. 3 (To be cont'd)

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SECURITY CLASSIFICATION: Customer Release NUMBER: 108-5294	Para.	Test Items	Requirements		Procedures	
	Physical Performance					
	3.5.8	Vibration Sinusoidal High Frequency	No electrical discontinuity greater than 1 microsecond (s) shall occur. Fig. 6.		Subject mated connectors to 20-200 Hz vibration traversed in 1 minute with 4.5 G (44 m/s <sup>2</sup> ) accelerated velocity: for 4 hours in up-down, 2 hours in back-forth, and 2 hours in right-left directions.	
	3.5.9	Connector Mating Force	No. of Pos.	Mating Force N <sub>MAX</sub> (kgf max.)		Using autograph measure the force required to mate connector without locking latch by operating at 100 mm a minute.
			2	49 (5.0)		
	3.5.10	Connector Unmating Force	No. of Pos.	Unmating Force N <sub>MAX</sub> (kgf max.)		Using autograph measure the force required to unmate connector without locking latch, by operating at 100 mm a minute.
			2	29 (3.0)		
	3.5.11	Handling Ergonomics	Connector shall be free from sharp edges that can injure or fatious assemblers' hands during mating and unmating.		Manually repeat mating and unmating to confirm the absence of sharp edges.	
	3.5.12 (a)	Contact Retention Force (a)	78 N (8 kgf) min.		Apply axial load to contact by operating without double lock plate at a rate of 100 mm a minute. Use contact lead crimped on 0.85 mm <sup>2</sup> wire or greater.	
	3.5.12 (b)	Contact Retention Force (b)	98 N (10 kgf) min.		Measure in the same manner as (a), with double lock plate set in effect.	
	3.5.13	Contact Disengaging Force	2 N (200 kgf) min. per contact.		Apply an axial pull-off load to mated contacts on the tester at a rate of 100 mm a minute.	
	3.5.14	Crimp Tensile Strength	Wire Size		Crimp Tensile (min.)	Apply an axial pull-off load to crimped wire of contact secured on the tester, at a rate of 100 mm a minute.
			mm <sup>2</sup>	(AWG)	N (kgf)	
			0.5	#20	88 (9)	
0.85			#18	128 (13)		
1.25			#16	177 (18)		
2			#14	265 (27)		
3	#12	294 (30)				

Fig. 3 (To be cont'd)

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Para.	Test Items	Requirements	Procedures
3.5.15	Durability (Repeated Mate/Unmating)	Termination Resistance (Low Level) (Final) 10 mΩ max.	Mate and unmate connectors for 30 cycles at a rate of 100 mm a minute.
3.5.16	Housing Lock Strength	98 N (10 kgf) min.	Determine strength of housing locking mechanism by applying an axial pull-off load to engaged housings, until the housings are separated with or without breakage of locking device.
3.5.17	Resistance to "Kojiri"	After testing, the requirements per Test Sequence specified in Para. 3.6 shall be met.	Securely fasten one of the mated connectors on a sturdy bench, and apply prying and twisting motions of 196 N (20 kgf · cm (T)) to free end connector in back forth direction at every 1 mm depth graduation until separation. Making this a cycle, repeat for 30 cycles. After completion, repeat in the right-left direction in the same manner for another 30 cycles. See Fig. 6.
<b>Environmental Requirements</b>			
3.5.18	Thermal Shock	Termination Resistance (Low Level) (Final) 10 mΩ max.	Subject mated connectors to 5 cycles between $-30 \pm 5^\circ\text{C}$ and $85 \pm 5^\circ\text{C}$ , each cycle consisting of 2 hours holding at each extreme with temperature transition within 5 minutes.
3.5.19	Humidity, Steady State	Termination Resistance (Low Level) (Final) 10 mΩ max.	Subject mated connectors to steady state humidity at $60^\circ\text{C}$ and 90-95% R.H. by applying test potential of 12 V DC. Measure after reconditioning to room temperature.
3.5.20	Salt Spray	Termination Resistance (Low Level) (Final) 10 mΩ max.	Subject mated connectors to 5% salt concentration for 96 hours for 2 cycles with one hour interval taken between them. After completion, rinse with tap water, and have them dried for 1 hour before measurement..

Fig.3 (To be cont'd)

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Para.	Test Items	Requirements	Procedures		
3.5.21	Resistance to Heat :	Termination Resistance (Final) 10 mΩ max	Subject mated connectors to exposure of 120 °C for 120 hours. Recondition for 30 minutes at room temperature before measurement.		
3.5.22	Resistance to Cold	Termination Resistance (Low Level) 10 mΩ max.	Subject mated connectors to exposure of - 50 °C ± 5 °C for 120 hours. Recondition at room temperature for 30 minutes before measurement.		
3.5.23	Dust Bombardment	Termination Resistance (Low Level) 10 mΩ max.	Subject mated connectors to a spray of Portland cement (JIS R 5210) propelled by compressed air at a rate of 1.5 kg in 10 seconds in every 15 minutes, in a closed chamber of 1,000 mm cube with the sample connector hung 150 mm away from the chamber wall.		
3.5.24	Icing	Termination Resistance (Low Level) 10 mΩ max.	Subject mated connector to immersion in boiling water for 1 hour.		
3.5.25	Resistance to Sulfurous Acid Gas	Termination Resistance (Low Level) 10 mΩ max.	Subject mated connectors to exposure under sulfurous acid gas of 10 p.p.m. concentration in the room temperature with 90 % R.H. minimum for 24 hours.		
3.5.26	Resistance to Oil	Termination Resistance (Low Level) 10 mΩ max.	Subject mated connectors to immersion in the oil shown be low, at 50 ± 5 °C for the specified duration, in the specified sequence. Rinse in kerosene for 5 minutes between every interval of oil immersion.		
			Step	Names of Oils	Duration
			1	Torque Converter Oil	1 Hour
			2	Transmission Oil	1 Hour
			3	Engine Oil	1 Hour
			4	Clutch Oil	1 Hour
5	Brake Oil	1 Hour			

Fig.3 (To be cont'd)

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Para.	Test Items	Requirements	Procedures
3.5.27	Resistance to Coolant	Termination Resistance (Low Level) 10 mΩ max.	Subject mated connectors to immersion in commercial coolant at $50 \pm 2$ °C for 2 hours. After this duration, rinse in tap water for 5 minutes, and have them dried at room temperature before measurement.
3.5.28	Resistance to Frontshield Washer Agent	Termination Resistance (Low Level) 10 mΩ max.	Subject mated connectors to immersion in commercial front shield washer agent at $50 \pm 2$ °C for 2 hours. After this duration, rinse in tap water for 5 minutes, and have them dried at room temperature before measurement.
3.5.29	Resistance to Ozon	Termination Resistance (Low Level) 10 mΩ max. No abnormalities shall be present, when evaluated per Class C, Para. 9 of JIS D 0205, and Para. 6.6 of JIS K 6301 for aged cracking of rubber.	Subject mated connectors to ozon test atmosphere in the closed test chamber at $40 \pm 2$ °C by hanging for 24 hours. The concentration of ozon shall be $50 \pm 5$ p.p.m. per Para. 16 of JIS K 6301.
3.5.30	Water Sprinkle	Termination Resistance (Low Level) 10 mΩ max. Current Leakage : 100 μA max.	Subject mated connectors to water sprinkle test in the closed test chamber where the samples are heated at $120$ °C $\pm$ 3 °C for 40 minutes and sprinkle water of normal temperature for 20 minutes. Making this a cycle, repeat for 48 cycles per Test Class S1 of JIS D 0203. During test, apply test potential of 12 V DC by using lead wires of 2 meters.

Fig.3 (To be cont'd)

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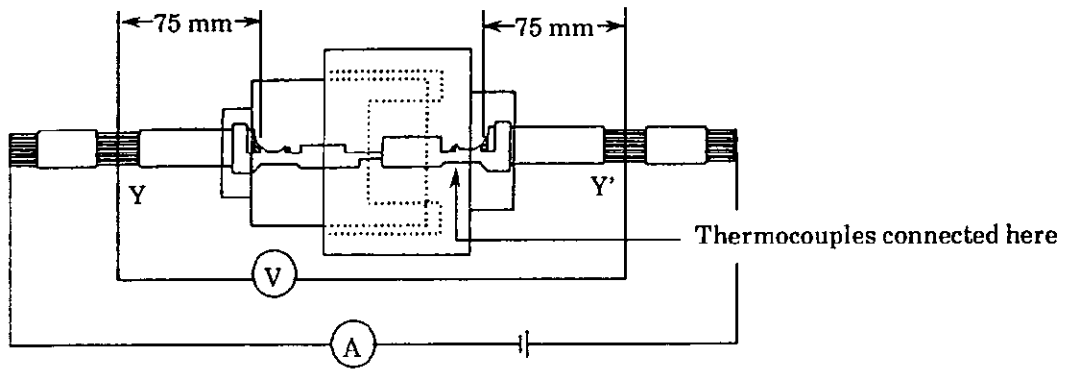
Para.	Test Items	Requirements		Procedures
		Initial	Final	
3.5.31	Watertight Sealing	49 KPa (0.5 kgf / cm <sup>2</sup> ) min.	29.4 KPa (0.3 kgf / cm <sup>2</sup> ) min.	Subject one of mated connectors to be drilled in order to make a hole, through which compressed air of 0.1 kg/cm <sup>2</sup> (9.8 KPa) is blown in inside them while the wire ends are solder-sealed with insulation ends masked with adhesives. Immerse in water in 30 cm max. deep for 30 seconds. Monitor for air leakage and increase pressure by 9.8 kPa (0.1 kgf / cm <sup>2</sup> ) graduation, until leakage takes place.

Fig.3 (end)

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To obtain termination resistance, deduct resistance of wire from the measured reading. For measuring millivolt drop value, apply test current of 1 A at 12 V DC to the mated connectors.

Fig. 4 Measurement of Termination Resistance

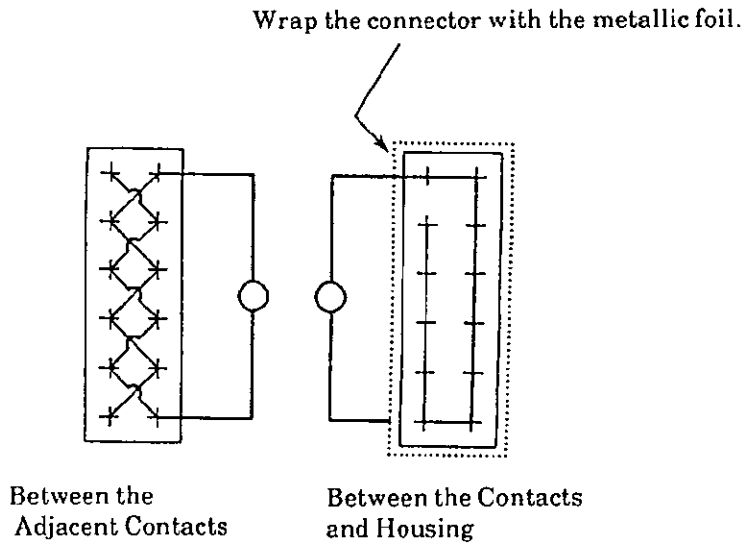


Fig. 5 Measurement of Insulation Resistance and Dielectric Strength

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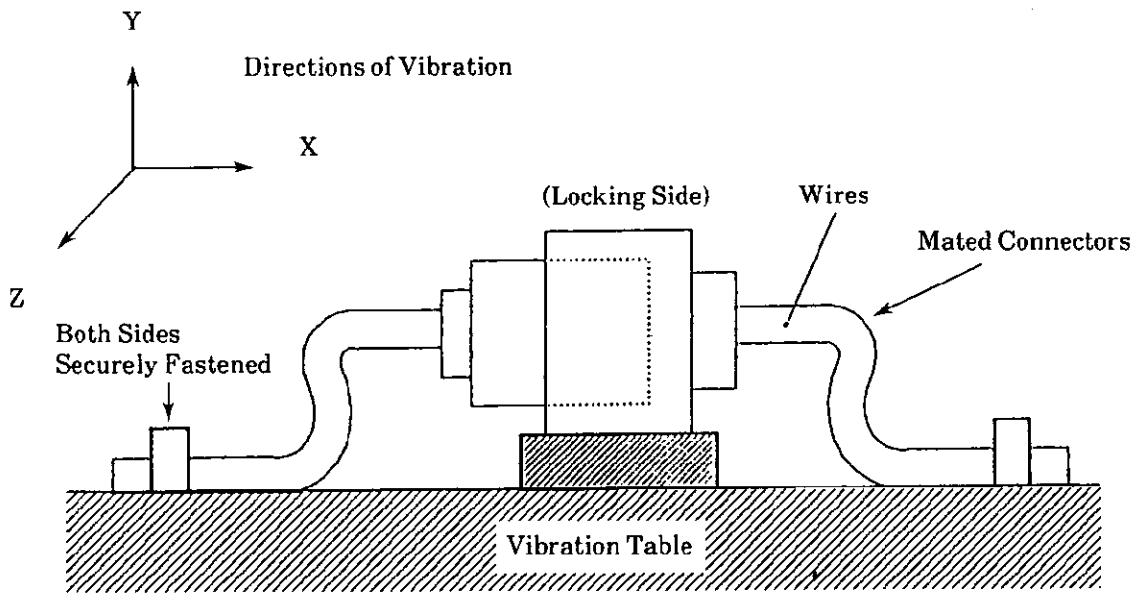


Fig. 6

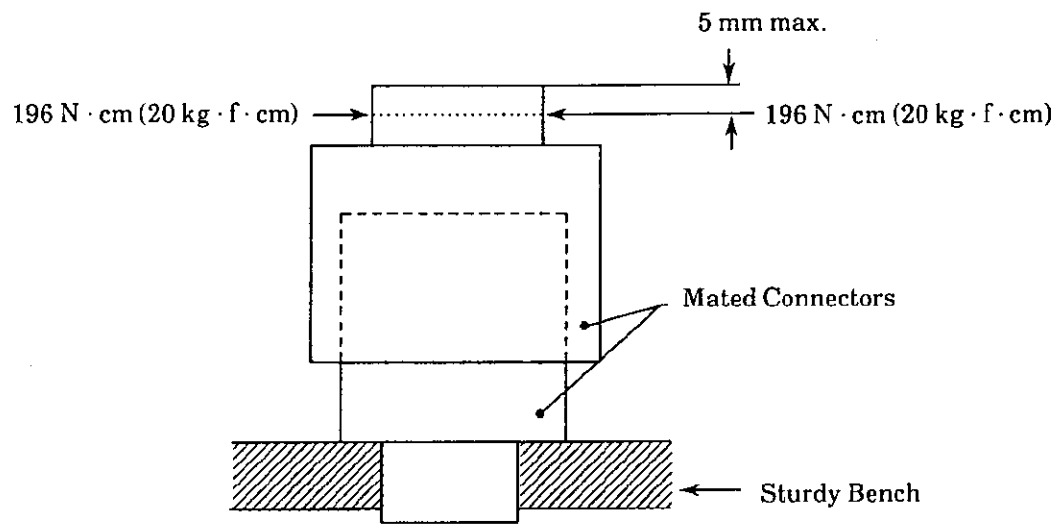


Fig. 7 "Kojiri" Resistance Test Method

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3.6 Product Qualification and Requalification Tests.

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Test or Examination	Test Group (a)											
	1	2	3	4	5	6	7	8	9	10	11	12
	Test Sequence (b)											
Confirmation of Product	1	1	1	1	1	1	1	1	1,4	1,4	1	1
Termination Resistance, Specified Current							3,6,8					
Termination Resistance, Dry Circuit				3,6,8 10,12		2,6 8,10	7	2,4	2,5,7	2,5	2,6	2,4
Dielectric Withstanding Volage					3							
Insulation Resistance						3,11						
Temperature Rise vs Current					2							
Current Cycling												3
Vibration											3	
Mating Force				2								
Unmating Force				4								
Contact Retention Force (a)			2									
Contact Retention Force (b)												5
Contact Unmating Force	3											
Crimp Tensile Strength		2										
Durability											5	
Housing Lock Strength					5							
Thermal Shock				11								
Humidity, Steady State				9								
Corrosion, Salt Spray									3			
Handling Ergonomics							4					
Current Leakage					4							
Resistance to "Kojiri"							5					
Heat Aging				5								
Resistance to Cold				7								
Dust Bombardment						9						

Fig. 8 (To be cont'd)

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3.6 Product Qualification and Requalification Tests.

Test or Examination	Test Group (a)											
	1	2	3	4	5	6	7	8	9	10	11	12
	Test Sequence (b)											
Icing							7					
Sulfurous Acid Gas									3			
Resistance to Oil						7						
Resistance to Coolant						4						
Resistance to Frontshield Washer Agent						5						
Resistance to Ozon									6			
Water Sprinkling								3				
Watertight Sealing				13			9	5	8			

- (a) See Para 4.1.A.
- (b) Numbers indicate sequence in which tests are performed.
- (c) Discontinuities shall not take place in this test group, during tests.

Fig. 8 (end)

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