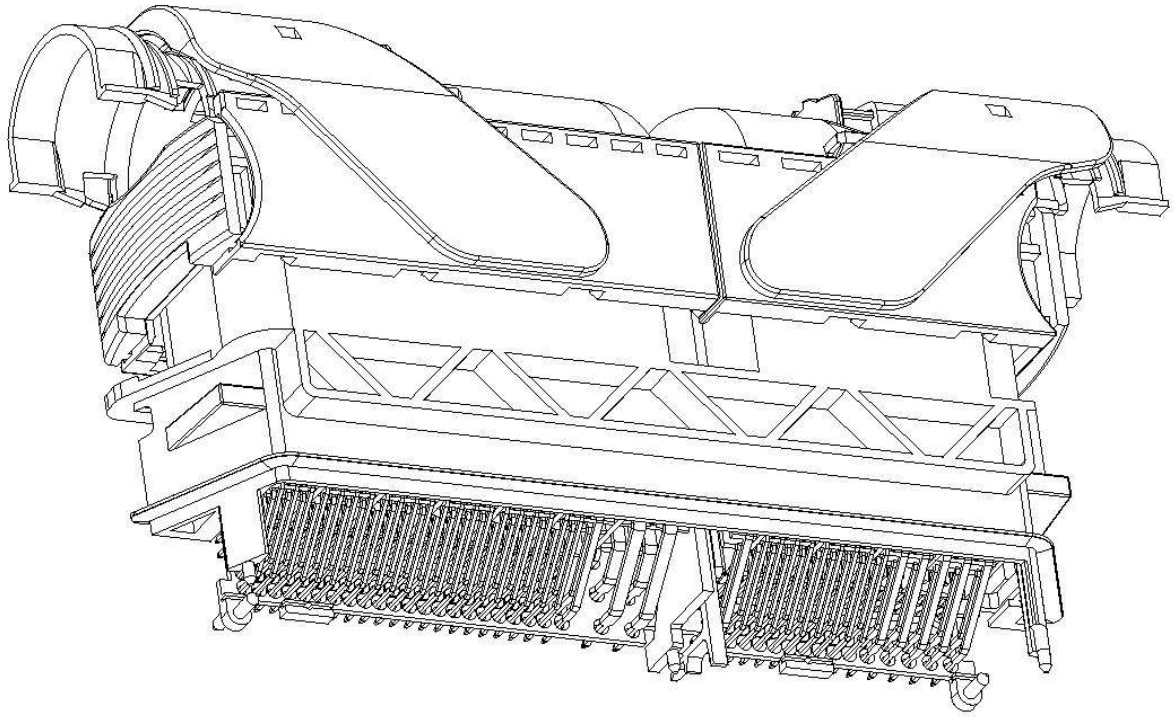
154 POSITIONS HEADER AND RECEPTACLE CONNECTORS FOR ENGINE MANAGEMENT



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0.1 CONTENTS

This specification covers the requirements for product performance, test methods and quality assurance provision for the 154 positions header and receptacle connector system for engine management, composed by the parts listed in the following table:

Description	Part number
154 positions Header	284617-1
Socket housing, 60w	284742-1
Socket housing, 94w	284743-1
MQS Clean Body contact, WSR 0.35-0.5 mm^2	968220-1
MQS Clean Body contact, WSR 0.75 mm^2	968221-1
1.5 mm Clean Body contact, WSR 0.5 mm^2	1452158-1
1.5 mm Clean Body contact, WSR 0.75-1.5 mm^2	1241608-1
AMP MCP2.8K, SWS, WSR 0.5-1 mm^2	1241394-1
AMP MCP2.8K, SWS, WSR > 1-2.5 mm^2	1241396-1
Single wire seal for AMP MCP2.8K	963292-1,963293-1,963294-1 (For the assignment of the individual seals to the various wire cross-sections, see the drawing of the individual seal)

0.2 APPLICABLE DOCUMENTS

Product drawings have to be considered part of this specification. In case of conflicts between specification and referenced documents, this specification shall take precedence.

0.3 TE CONNECTIVITYSPECIFICATIONS

A. 109-1 Test Specification, General Requirements for Test Methods
B. 108-18030 Product Specification, Micro-Quadlock-System
C. 108-18717/108-18513-0 Product Specification, AMP MCP 2.8

0.4 STANDARD AND SPECIFICATIONS

A. Low Voltage Stranded Cables for Automobiles according to FIAT normation table Nr. 91107/05 and 91107/17.
B. FIAT General Specification for Connectors 9.91320/02 Ed. 7.

0.5 DESIGN AND CONSTRUCTION

Product shall comply with design, construction and physical dimensions specified in the applicable product drawing.

0.6 RATINGS

A. TEMPERATURE RATING: -40°C TO +125 °C (including the temperature increasing due to working current flow).

B: MAXIMUM OPERATING VOLTAGE: 24 V dc. For application at higher voltage please contact TE Connectivity

C. MQS Clean Body CURRENT RATING:

7,5 A max. with 0.75 mm^2 wire
6,0 A max. with 0.50 mm^2 wire
3,5 A max. with 0.35 mm^2 wire

D. 1.5 mm MQS Clean Body CURRENT RATING:

14,0 A max. with 1.50 mm^2 wire
11,0 A max. with 1.00 mm^2 wire
9,0 A max. with 0.75 mm^2 wire
6,0 A max. with 0.50 mm^2 wire

E. AMP MCP2.8K CURRENT RATING:

20,0 A max. with 2.50 mm^2 wire
14,0 A max. with 1.50 mm^2 wire
11,0 A max. with 1.00 mm^2 wire
6,0 A max. with 0.50 mm^2 wire

- Current rating per wire section a.m. are according to Fiat spec. 91107/05, 91107/17

0.7 QUALITY ASSURANCE PROVISION

A. SAMPLES PREPARATION

The test samples to be used for the test shall be prepared by random selection from the current production and the contact shall be crimped in accordance with the Application Specifications: 114-18021, 114-18286, 114-18387/114-18148.
No sample shall be reused, unless otherwise specified.

B. TEST CONDITION:

All the test shall be performed under any combination of the following test condition, unless otherwise specified:

- Room temperature: 23±5°C
- Relative humidity: 45÷70%
- Atmospheric pressure: 860÷1060 mbar

0.8 TEST REQUIREMENTS AND PROCEDURES

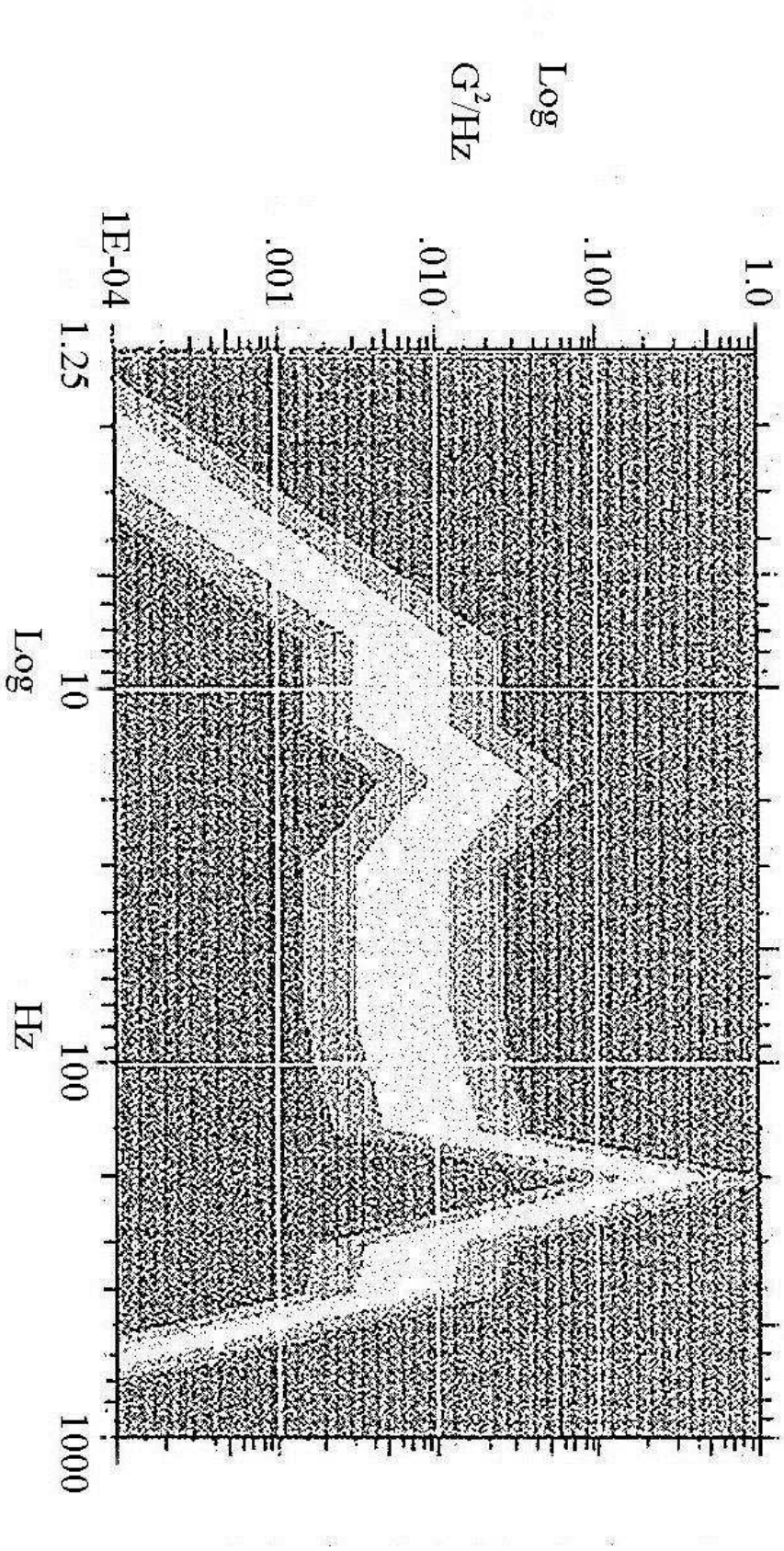
#	Test	Procedures	Requirements
PRODUCT EXAMINATION			
1.1	Visual aspect	Visual Inspection	Compliance with relevant drawings
1.2	Dimensions and tolerances		Following relevant drawings
1.3	Marking	Visual Inspection	Supplier's indications must be clear and legible
1.4	Materials and coverings		Following relevant drawings
ELECTRICAL REQUIREMENTS			
2.1	Insulation resistance	Applied voltage 500 V dc between one contact and the others short circuited.	≥10MΩ
2.2	Dielectric strength	>1000V ac for 1 minute Test between adjacent circuits of mated connectors	Neither creeping discharge nor flash over shall occur
2.3	Voltage Drop	Between a point of the wire at 1 cm from the connector edge and a point very close to the header edge, at the nominal current for each wire size. (Termination resistance is obtained after subtraction of the resistance of wire used for termination)	On new contacts and after ten in/outs Class of terminal types 0.63 / 1.5 / 2.8 ≤5mV/A / ≤4mV/A / ≤4mV/A
2.4	Contact Resistance	On terminal without housing mated. Placed the measure points in the transition zones	Class of terminal types 0.63 / 1.5 / 2.8 ≤4mΩ / ≤3mΩ / ≤3mΩ
2.5	High temperature resistance with current load.	On 6 adjacent ways contemporary. 5 temperature cycles composed of: - 5 hours in oven at 80 ±2°C without air ventilation, with rated current according to wire size. (see point **0.6**) - 2 hours in freezing cell at –30°C, without current. (thermocouple placed on transition zone of each contact)	• Over temperature in transit area: ≤45°C (at the end of the first test cycle) • Voltage drop within the original limit specified • No damage • Over temperature in transit area: ≤50°C (at the end of 5 test cycles)
2.6	Current overload	On one pair of mated contacts without housing: Test current 1.5 time nominal current (See par. 0.6) – Duration 500 cycles composed of: 45 min current ON 15 min current OFF (Thermocouple placed between contact body and wire barrel)	• Over temperature in transit area: ≤70°C • Voltage drop: a max 50% decay is allowed from the original prescribed limit

#	Test	Procedures	Requirements				
MECHANICAL REQUIREMENTS FOR HEADER							
3.1	Pin and tab retention force in header	Apply an axial force on pin and tab in order to remove them from the header. Operation speed: 25 mm/min	Class of terminal types				
			0.63	1.5	2.8		
			≥25N	≥40N	≥50N		
MECHANICAL REQUIREMENTS FOR FEMALE TERMINALS							
4.1	Single contact mating and un-mating force	Operation speed: 50 mm/min (with relevant counterpart pin and tabs)	Class of terminal types				
			0.63	1.5	2.8		
			On. 1st mating and un-mating				
			≤5N	≤5N	≤15N		
			On 10th un-mating				
			≥2N	≥2.5N	≥4N		
4.2	Contact insertion force into housing (crimp contacts)	Insert contacts into the cavities with operating speed of 25 mm/min. The housing has to be mounted on a self aligning platform.	Class of terminal types				
			0.63	1.5	2.8		
			≤15N	≤20N	≤25N		
4.3	Pull-out force of contacts from housing. (crimp contacts)	Pulling wires axially with an operating speed of 50 mm/min	Class of terminal types				
			0.63	1.5	2.8		
			With primary lock only				
			≥30N	≥45N	≥60N		
			with primary and secondary lock				
			≥60N	≥100N	≥100N		
4.4	Crimp tensile	Apply a pulling force to the terminal correctly crimped on wire for 1 minute. Operating speed: 25÷50 mm/min	Class of wire sizes [mm²]				
			0.5	0.75	1.0	1.5	2.5
			≥70N	≥90N	≥115N	≥155N	≥235N
MECHANICAL REQUIREMENTS FOR CONNECTORS							
5.1	Connector mating and un-mating force	With correspondent header counterpart all assembled moving the lever with an operating speed of 50 mm/min	• ≤ 70 N at 1st mating / un-mating for connectors equipped with force reduction device (lever, slide, etc.). • Max. 50% decay is admitted after thermal cycles.				
5.2	Front seal retention force	Pull front gasket with proper fixture at speed of 25 to 100 mm/min	> 15 N				
5.3	Connector retention force	With relevant Header counterpart assembled, apply a pulling force axially to the female connector mating direction, with an operating speed of 60±10 mm/min	> 120 N				
5.4	Mechanical retention of the connector	Connector fully loaded mated with the corresponding header counterpart (wire bundle fixed to the shell by a tie) Operating speed: 100 mm/min Apply an axial pull-off load of 120 N to the cables bundle in all directions of the semi-sphere over the wire exit plane.	• No uncoupling of connector, not even partial • No extraction, detachment from connection, opening of electric contact • No damage on the coupling system				
5.5	Polarization effectiveness	Assembled connectors must withstand without mating the counterpart with the incorrect polarization	• No coupling of connector or closing of electrical contact for a force < 100 N				

#	Test	Procedures	Requirements		
MECHANICAL REQUIREMENTS FOR SECONDARY LOCK					
6.1 6.1.1	Closing force of secondary lock with all terminals correctly inserted	Apply increasing load parallel to the operating direction and measure force to actuate.	Class of terminal types		
			0.63	1.5	2.8
			≤ 30N	≤ 40N	≤ 40N
6.1 6.1.2	Closing force of secondary lock with one or more contacts not correctly inserted	Apply increasing load parallel to the operating direction and measure force to actuate.	Class of terminal types		
			0.63	1.5	2.8
			≥ 80 N	≥ 120 N	≥ 120 N
6.2	Connector mating force with secondary lock not completely closed	Apply increasing load parallel to the operating direction and measure force to actuate.	≥ 100 N		
MECHANICAL REQUIREMENTS FOR SLIDES AND LEVER					
7.1	SLIDE retention force in pre-assembled position	Pull slide axially to its operating direction with increasing force	≥ 50 N		
7.2	LEVER resistance to transversal load	Apply 100 N transversal load to the lever positioned open and at the middle of its operating angular displacement. Apply 60 N transversal load to the lever in all other positions of its operating angular displacement.	• No lever stepping and/or damages; permanent deformations are allowed if they do no affect the lever operation		
7.3	LEVER locking resistance force (without C.P.A. device)	Apply a load to the lever with connection completely closed (without C.P.A. device) in order to open it	≥ 70 N		
MECHANICAL REQUIREMENTS FOR C.P.A DEVICE					
8.1 8.1.1	C.P.A. device actuating force (with lever correctly closed)	With female connector lever completely closed, apply a load to C.P.A. device in order to close it (direction of load should be parallel to the C.P.A. displacement direction.	≤ 30 N		
8.1 8.1.2	C.P.A. device actuating force (with lever not correctly closed)	With female connector lever NOT completely closed, apply a load to C.P.A. device due to close it (direction of load should be parallel to the C.P.A. displacement direction.)	≥ 80 N		
8.2 8.2.1	C.P.A. device retention force (in open position)	With connector equipped with cover and C.P.A., apply a pulling force to the C.P.A. in order to remove it from the cover	≥ 60 N		
8.2 8.2.2	C.P.A. retention force (in closed position)	With connector equipped with cover and C.P.A. apply a load to the C.P.A. device in order to move it in its pre-locking position	≤ 20 N		

#	Test	Procedures	Requirements
ENVIROMENTAL REQUIREMENTS			
9.1	Accelerating aging	On mated connector submitted to the following cumulative tests: **A**- 5 cycles composed of: 2 hrs at 125°C ±2°C 2 hrs at –30°C ±2°C **B**- 5 cycles composed of 2 hrs at 125°C ±2°C 2 hrs at 40°C ±2°C and 90-95% r.h. 2 hrs at –30°C ±2°C **C**-200 hrs at 125°C	• No deformation, scraping or breaking; color variations are allowed on. plastic material • Insulation resistance and discharge voltage within the limits specified • Voltage drop max 50% decay is allowed from the original limit • Initial contact resistance and resistance of short-circuit device: a max 50% decay is allowed from the original limit • After 10 mating and un-mating: characteristics and mechanical tests within the original limits specified with 50% max variation allowed
9.2	Waterproof test of connection with peripheral gasket. (IP x.4)	Test according to IEC 529 par. 14.2.4 Duration : 4 hours Samples mated with relevant counterpart This test must be carried out after cumulative aging test (par. **9.1**) - This test must be carried out also on Header mating side without female counterparts.	• Insulation resistance and discharge voltage within the prescribed limits • No water infiltration inside the connector • No water infiltration through the pin and tab cavities (For test on Header only)
9.3	Waterproof test (on relevant header counterpart only). (IP x.5)	Test according to IEC 529 par. 14.2.5 Duration: 3 min. The header counterpart must be submitted to water jet on female counterpart mating side; the other side must be close and sealed. This test must be carried out after cumulative aging test (par. **9.1**)	• No water infiltration through the pin and tab cavities
9.4	High pressure washing test (on connection fully loaded and closed). (IP x.9K)	Test according to DIN 40050 index 9K Duration: 30 sec for each nozzle. Samples: mated with relevant counterpart. Submit the connection completely loaded with terminals, fixed with tie, to the cumulative action of the four nozzle. This test must be carried out after cumulative ageing test (par. **9.1**)	• No water infiltration inside the connector
9.5	Low temperature resistance test	Keep mated samples to –40°C for 2 hrs, move to 0°C in a time of 3 min. max and let stabilize, then un-mate and re-mate the connectors one time	• No breaking between connection parts
9.6	Salt spray corrosion test	150 hrs of exposure to salt mist at 35°C ±2°C, 5% of NaCl, pH 6.5÷7.2 class 2 (mated connector)	• Voltage drop ≤ specified limits for new contact increased of 100%
9.7	Kesternich corrosion test	4 cycles composed of: 8 hrs of exposure to an atmosphere with 0.66 % of SO2 at +40°C ±2°C (method acc. To DIN 50118) 16 hrs in free air (mated connectors)	• Voltage drop ≤ specified limits for new contact increased of 100%

#	Test	Procedures	Requirements
9.8	Chemical agents resistance test	Test complete, mated connectors with 3 min. of immersion in the following fluids (not cumulative test, use different samples for each fluid) : - Gasoline at 23°C ± 5°C - Cleaning agent at 23° C ± 5° - Break fluid at 50°C ± 5° C - Anti-freeze mixture at 23°C ± 5°C - ASTM1 oil/engine oil at 100°C ± 3° C - Unleaded engine fuel at 23°C ± 5°C - Transmission fluid at 100° C ± 3°C	• No damages, deformations, cracks, breakage on the parts. • Contact retention in housing, connector mating / un-mating forces according to the specified limits.
9.9	Resistance to alternating cycles of temperature, current and humidity	Submit mated samples to the following cumulative cycles: • 4 hrs at +80°C with current flow on 6 adjacent contacts at the maximum current for the wire size 45 min ON and 15 min. OFF. • 4 hrs at 40°C with 95% U.R. without current. • 4 hrs at –40°C without current	• No damages, deformations, cracks, breakage on the parts. • Insulation resistance, dielectric strength, voltage drop, Initial contact resistance, within the limits specified.
9.10	Random vibration in temperature	Temperature sequence during vibration as follows: -6h at +85°C -4h at +40°C -2h at –25°C PSD curve as per picture 1 Duration: 180 hours / 1 axis only	• No electric continuity missing (R>100Ω in >1μs time) during test • Voltage drop: a max. 50% decay is allowed from the original limit • Mechanical characteristics within the prescribed limits with 50% variation allowed



Picture 1

f (Hz)	8	12	18	30	50	72	150	200	300	400
G²/Hz	0,006	0,006	0,018	0,006	0,006	0,006	0,009	0,28	0,007	0,006

TABLE I
PRODUCT QUALIFICATION TEST SEQUENCE
TEST GROUPS

ITEM	DESCRIPTION	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1.1	Visual aspect	1	1,9	1,3	1,5	1,5	1,6	1,10	1,9	1,9	1,5	1,9	1,8	1,5	1,5	1,5	1,5	1,6	1,6
1.2	Dimensions and tolerances	2																	
1.3	Marking	3																	
1.4	Materials and coverings	4																	
2.1	Insulation resistance		4							8		5	2,6					4	4
2.2	Dielectric strength		5							7		6	3,7					5	5
2.3	Voltage drop		3,8		2,4	2,4				2,5	2,4	4		2,4	2,4				
2.4	Contact resistance		2,7							3,6		3					2,4		
2.5	High temperature resistance with current load				3														
2.6	Current over-load					3													
3.1	Pins and tabs retention force in header						2												
4.1	Single contact engaging and separating		6						2										
4.2	Contact insertion force into housing						3												
4.3	Pull out force of terminal from housing						4									4			
4.4	Crimp tensile			2															
5.1	Connectors mating force							2				7				3			
5.2	Front seal retention force						5												
5.3	Connector retention force								3										
5.4	Mechanical retention of the connector							3											
5.5	Polarization effectiveness							4											
6.1.1	Operating force of secondary lock with all contacts correctly inserted							5											
6.1.2	Operating force of secondary lock with one contact not correctly inserted							6											
6.2	Connector mating force with secondary lock not completely closed							7				8							
7.1	Slide retention force in open or pre-assembled position							8											
7.2	Lever resistance to transversal load							9											
7.3	Lever locking resistance force (with C.P.A. device actuated)								4										
8.1.1	C.P.A. actuating force with lever completely closed								5										
8.1.2	C.P.A. actuating force with lever NOT completely closed								6										
8.2.1	C.P.A. retention force in open position								7										
8.2.2	C.P.A. retention force (closed position								8										
9.1	Accelerating aging											2	4					2	2
9.2	Waterproof test of connection with peripheral gasket (IPx.4)												5						
9.3	Waterproof test on header counterpart (Ipx.5)																	3	
9.4	High pressure washing test (9k)																		3
9.5	Low temperature resistance test										3								
9.6	Salt spray corrosion test													3					
9.7	Kesternich corrosion														3				
9.8	Resistance to chemical agents															2			
9.9	Resistance to alternating cycles of temperature, current and humidity									4									
9.10	Random vibrations in temperature																3		