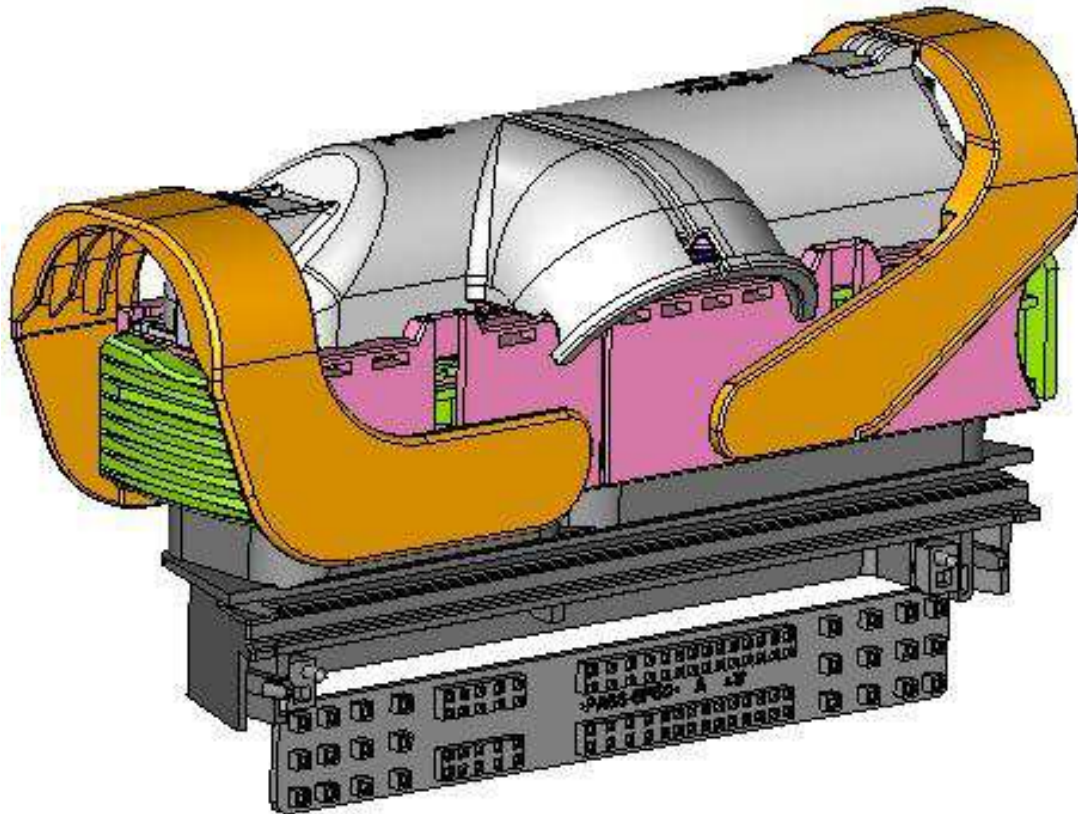


Product Specification

Plug Connector 100-Pin, waterproof
 “ Connector System for Engine Control Unit”



108- 61224

A	RELEASE	YH MA/ HG CHO	12-AUG-2013
REV.	DESCRIPTION	DR/CHK	DATE

1. Scope

1.1 Contents.

This specification covers the requirements for product performance, test methods and quality assurance provisions of TCU 100 Pin Connector.

The applicable product descriptions and part number are as follows:

2. Applicable Documents.

The following documents form 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.

TE Specifications :

- A. 109-5000 Test Specification, General Requirements for Test Methods
- B. 114-61046 Interface drawing for 100 POS. header assy
- C. 114-18148 Application Specification for MCP 2.8 receptacle
- D. 114-18286 Application Specification for AMP MQS 1.5 CB receptacle
- E. 114-18021 Application Specification for AMP MQS 0.63 CB receptacle
- F. 108-18513 Product specification for MCP 2.8 receptacle
- G. 108-18030 Product specification for MQS 1.5 CB receptacle
- H. 108-18030 Product specification for MQS 0.63 CB receptacle
- I. 411-XXXXX Instruction Sheet
- J. 114-XXXXX Application Specification

Reference Documents :

- ES-91500-00(EESA0418) : HMC Connector General Spec
- MS300-08(EMSB0358) : HMC Combustibility Spec
- MS300-34(EMSA0189) : HMC Smell Spec
- MS201-02(EMSC0027) : HMC Material Spec
- MS300-55(EMSC0012) : HMC VOCs Spec

3. Requirements :

3.1 Design and Construction:

Product shall be of the design, construction and physical dimensions Specified on the applicable product drawing.

3.2 Materials & Finish

- A. Contact : Receptacle Contact : Pre-tinned Copper Alloy
- B. Housing : PBT, PA66
- C. Seal Ring; Wire Seal Rubber : Silicone Rubber

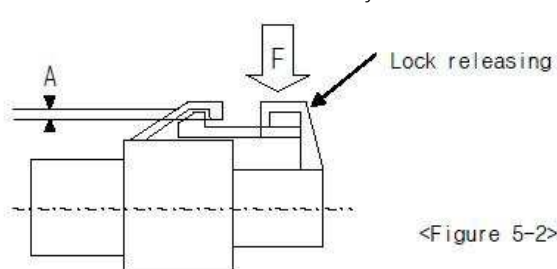
3.3 Ratings

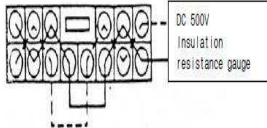
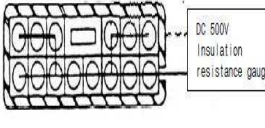
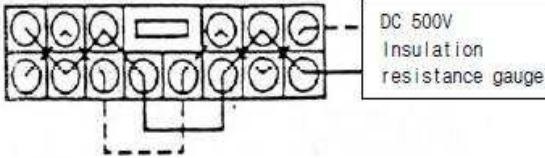
Temperature Rating: -40°C to + 120°C
(Ambient Temperature + Temperature Rise due to energized current)

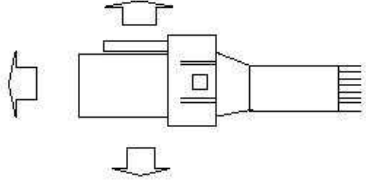
3.4 Performance Requirements and Test Descriptions :

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in Para. 3.5. All tests are performed at ambient temperature unless otherwise specified.

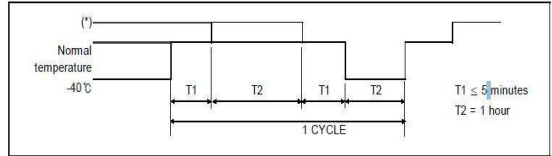
3.5 Test Requirements and Procedures Summary:

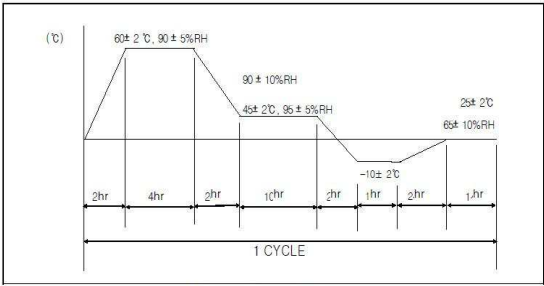
Para.	Test items	Requirements		Procedures
3.5.1	Appearance	No crack, damage, distortion are permitted		Using sense of sight and touch.
3.5.2	CONN engage and disengage force	Engage	Max 18kgf	Measure force by inserting and disengaging the connector with terminal assembled at constant 50 mm/min speed. However, remove lock part when measuring disengage force.
		Disengage		
3.5.3	Reverse insertion between housings	It shall not be incorrectly inserted by applying force of 20kgf.		Insert the housing with terminal by pushing it in reverse direction with applying 30kgf.
3.5.4	Contact to HSG Inverse Force	025	Min 5kgf	Crimp cable of maximum size on terminal and then insert it into housing by end of insulation barrel in the reserve direction.
		060		
		110		
3.5.5	Engage force between terminal and housing	025	Max 1.5kgf (General TM'L)	As shown in the following figure 5-1, measure the weight while inserting terminal into fixed housing at 50mm/min speed.
		060		
		110		
3.5.6	Strength of HSG lock	050 ~ 375 : Min 10kgf		Combine housing only, fix the one side of housing in completely locked condition, and extend the other side in axial direction and 30 angle direction at a constant speed of 100mm/min. Then measure weight when lock structure is disengaged or destroyed.
3.5.7	HSG lock releasing force	Max 6kgf		<p>Apply force (F) to lock releasing part, and measure weight on the point of A=0. However, cut connector and then perform test at the section in order to secure visibility.</p>  <p style="text-align: right;"><Figure 5-2></p>
3.5.8	Terminal retention force	025	Min 6kgf	Fix the housing after inserting crimped terminals. Extend one line of cable in axial direction at a speed of 50mm/min at a position 50~100mm away from crimped part, and measure weight when terminal is disengaged from the housing.
		060	Min 8kgf	
		110	Min 10kgf	

Para.	Test items	Requirements		Procedures												
3.5.9	Voltage Drop	025	Max 10mV/A	Between a point of wire at 10mm from the connector edge and a point very closed to the header edge. Voltage drop is obtained after deducing voltage drop of wire from measured value. <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Application</th> <th>Open voltage</th> <th>Short circuit current</th> <th>Division</th> </tr> </thead> <tbody> <tr> <td>Signal circuit</td> <td>20 ± 5mV</td> <td>10 mA</td> <td>ECU, Sensor</td> </tr> <tr> <td>Power circuit</td> <td>13 V</td> <td>1 A</td> <td>Other than the above</td> </tr> </tbody> </table>	Application	Open voltage	Short circuit current	Division	Signal circuit	20 ± 5mV	10 mA	ECU, Sensor	Power circuit	13 V	1 A	Other than the above
		Application	Open voltage		Short circuit current	Division										
		Signal circuit	20 ± 5mV		10 mA	ECU, Sensor										
Power circuit	13 V	1 A	Other than the above													
060	Max 5mV/A															
110	Max 3mV/A															
3.5.10	Insulation resistance	Min 250MΩ	Between terminals	Measure resistance between neighbor terminals (figure 5-6), and between terminal and housing surface (figure 5-7) with DC 500V insulation resistance gauge with connector combined. <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="font-size: small; margin-top: 5px;"> <Figure 5-6: Between neighboring terminals> <Figure 5-7: Between neighboring terminal and housing surface> </p>												
			housing surface													
3.5.11	Leakage current	Max 1 μA		Measure it by applying DC 14V between neighboring terminals (figure 5-6). <div style="text-align: center;">  <p style="font-size: small; margin-top: 5px;"><Figure 5-6: Between neighboring terminals></p> </div>												
3.5.12	High voltage test	No allowed insulation breakdown	Between terminals	Measured by applying test potential of 1000 V AC between the adjacent contact between the contact and housing.												
			housing surface													
3.5.13	Twisting Test	Appearance	No crack, damage, distortion are permitted	Apply 8kgf force on the end part of combined connector 10 times each in the (front, rear, left, right) directions perpendicular to axial direction.												
		025	Max 20mV/A													
		060	Max 10mV/A													
110																

Para.	Test items	Requirements	Procedures	Procedures	
3.5.14	Connector Engage and Disengage Endurance Test	Appearance	No crack, damage, distortion are permitted	Make combine connectors engage and disengage at 100mm/min. Perform it 50 times. (Do not use locking device)	
		025	Max 20mV/A		
		060	Max 10mV/A		
		110			
3.5.15	Cold Resistance	Appearance		No crack, damage, distortion are permitted	
		Insulation Resistance	Sealed CONN'R : Min 100MΩ	Between terminals	Engage and disengage connector with terminal assembled 10 times with hands, and leave it in temperature chamber of -40℃ for 120 hours. Make connector engaged and disengaged 5 times immediately, and drop it onto the concrete surface from 1m height 3 times in the direction of figure 6-1. (Voltage drop & Temperature rise test perform at normal temperature) :
				housing surface	
		Voltage Drop	025	Max 20mV/A	
			060	Max 10mV/A	
			110		
		Current Leakage	Sealed CONN'R : Max 100 μA		
		Temperature Rise	025 (0.75SQ)	Max 40℃	
060 (0.75SQ)					
110 (3.0SQ)					
Waterproof Test	Min 0.5kgf/cm ²				
3.5.16	Thermal shock test	Appearance	No crack, damage, distortion are permitted	 <p><Figure 6-1></p>	
		Voltage Drop	025		Max 20mV/A
			060		Max 10mV/A
			110		
Waterproof Test	Min 0.5kgf/cm ²				
3.5.17	Heat Resistance	Voltage Drop	2.8mm		
		Voltage Drop Waterproof Test	025	Max 20mV/A	
			060	Max 10mV/A	
			110		
Waterproof Test	Min 0.5kgf/cm ²				

☞ Engage and disengage Connector with terminal assembled 10 times with hands, this repeats 200 CYCLE by below test condition. (ENG ROOM : 120℃, ENG ROOM except : 80℃)



Para.	Test items	Requirements		Procedures		
3.5.18	Temperature Humidity Test	Appearance	No crack, damage, distortion are permitted		<p>Engage and disengage connector with terminal assembled 10 times with hands, and leave it at 25°C ambient temperature and 65% relative humidity for 25 hours. And perform 5 cycles of the method specified in figure 6-3. Then pick connector out of chamber and dry it for 2 hours or more.</p>  <p>< Figure 6-3 : Test pattern ></p>	
		Voltage Drop	025	Max 20mV/A		
			060	Max 10mV/A		
			110			
		Insulation Resistance	Min 100MΩ	Between terminals		housing surface
				housing surface		
Current Leakage	Max 100μA					
Waterproof Test	Min 0.5kgf/cm ²					
3.5.19	Dust test	Voltage Drop	025	Max 20mV/A	<p>Engage and disengage connector with terminal assembled 10 times with hands, and diffuse 1.5kg Portland cement(JIS R5210) with fan (or others) for 10 seconds per 15 minutes while maintaining 150mm distance from wall in the closed container of 900~1200mm length, width and height, with connector combined. After 1 hour, measure it.</p>	
			060	Max 10mV/A		
			110			
Waterproof Test	Min 0.5kgf/cm ²					
3.5.20	Waterproof test (for waterproof connector)	Appearance	No crack, damage, distortion are permitted		<p>Make combined connectors engaged and disengaged 10 times by hands, and leave it in combined state at 120°C ambient temperature for 40 minutes and then spray water of normal temperature for 20 minutes according to S2 of JIS D0203. Repeat 48 cycles of this. * JIS D0203 S2 condition: Attach specimen at 400mm distance from the waterproof pipe with water spray hole or water discharge hole, and rotate waterproof pipe 23 times per minute around the axis (XX).</p>	
		Insulation Resistance	Min 100 MΩ	Between terminals		
				housing surface		
		Current Leakage	Max 100 μA			
Waterproof Test	Min 0.5kgf/cm ²					

Para.	Test items	Requirements		Procedures	
3.5.21	Oil and liquid test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and perform test each sample with connector combined. A. Immerse connector in combined state for 2 hours in mixed oil of $50 \pm 2^\circ\text{C}$ ENG oil (SAE 10W) or equivalent oil and B. Immerse connector in combined state for 1 hour in car gasoline (JIS K2202) at normal temperature, and then pick it out. C. Immerse connector in combined state for 1 hour in brake liquid (pure product) at normal temperature, and then pick it out. D. Immerse connector in combined state for 1 hour in 100% washer liquid (pure product) at normal temperature, and then pick it out. E. Immerse connector in combined state for 1 hour in 50% LLC (Long life coolant) at normal temperature, and then pick it out.
		Voltage Drop	025	Max 20mV/A	
			060	Max 10mV/A	
			110		
Waterproof Test	Min 0.5kgf/cm ²				
3.5.22	Ozone test	Appearance	No crack, damage, distortion are permitted		Engage and disengage Connector with terminal assembled 10 times with hands, and samples keep at 40°C and $50 \pm 5\text{ppm}$ Ozon for 100hour.
		Voltage Drop	025	Max 20mV/A	
			060	Max 10mV/A	
			110		
Waterproof Test	Min 0.5kgf/cm ²				
3.5.23	Salt water test (for waterproof connector)	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and put it in 35°C temperature regulation chamber, spray 5% salty water for 24 hours according to JISZ2371, and, maintain 35°C without spray for 1 hour. Then repeat this four times. Then pick connector out of chamber and dry it for 2 hours or more.
		Insulation Resistance	Min 100 M Ω	Between terminals	
				housing surface	
		Current Leakage	Max 100 μA		
		Voltage Drop	025	Max 20mV/A	
060	Max 10mV/A				
110					
3.5.24	Sulfur(SO ₂) gas test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and expose it in combined state to sulfur gas of $40 \pm 3^\circ\text{C}$, density 10ppm, humidity 90~95%, for 24 hours. Then pick connector out of chamber and dry it for 2 hours or more.
		Voltage Drop	025	Max 20mV/A	
			060	Max 10mV/A	
			110		
Waterproof Test	Min 0.5kgf/cm ²				

Para.	Test items	Requirements		Procedures																																			
3.5.25	Composite Environmental Vibration /Mechanical Test	Appearance	No crack, damage, distortion are permitted		<p>Engage and disengage Connector with terminal assembled 10 times with hands and leave it in combined state in the temperature chamber of 120°C for 48hours. And then perform the following vibration test.</p> <table border="1"> <thead> <tr> <th rowspan="2">Division</th> <th rowspan="2">Condition (Nonsealed CONNECTOR)</th> <th colspan="2">Condition (Sealed CONNECTOR)</th> </tr> <tr> <th>SINE TEST</th> <th>RANDOM TEST</th> </tr> </thead> <tbody> <tr> <td>Ambient temperature/humidity</td> <td>80°C, 90~95%</td> <td>120°C</td> <td>120°C</td> </tr> <tr> <td>Applied current</td> <td>Basic current (Connect electrodes in series.)</td> <td>Basic current (Connect electrodes in series.)</td> <td>Basic current (Connect electrodes in series.)</td> </tr> <tr> <td>Current application cycle</td> <td>120 CYCLE (45min.-ON, 15min.-OFF)</td> <td>120 CYCLE (45min.-ON, 15min.-OFF)</td> <td>24 CYCLE (45min.-ON, 15min.-OFF)</td> </tr> <tr> <td>Vibration acceleration</td> <td>4.4G</td> <td>SINE fig.</td> <td>RANDOM fig.</td> </tr> <tr> <td>Frequency</td> <td>20Hz ~ 200Hz (SWEEP TIME ~ 3MIN or less)</td> <td>20Hz ~ 200Hz (SWEEP TIME ~ 3MIN or less)</td> <td>RANDOM fig.</td> </tr> <tr> <td>Vibration time</td> <td>X, Y, Z each 40hours</td> <td>X, Y, Z each 40hours</td> <td>X, Y, Z each 8hours</td> </tr> <tr> <td>Connector attaching method</td> <td>Test Mode A, B, C</td> <td>Test Mode A, E, G</td> <td>Test Mode D, F</td> </tr> </tbody> </table> 	Division	Condition (Nonsealed CONNECTOR)	Condition (Sealed CONNECTOR)		SINE TEST	RANDOM TEST	Ambient temperature/humidity	80°C, 90~95%	120°C	120°C	Applied current	Basic current (Connect electrodes in series.)	Basic current (Connect electrodes in series.)	Basic current (Connect electrodes in series.)	Current application cycle	120 CYCLE (45min.-ON, 15min.-OFF)	120 CYCLE (45min.-ON, 15min.-OFF)	24 CYCLE (45min.-ON, 15min.-OFF)	Vibration acceleration	4.4G	SINE fig.	RANDOM fig.	Frequency	20Hz ~ 200Hz (SWEEP TIME ~ 3MIN or less)	20Hz ~ 200Hz (SWEEP TIME ~ 3MIN or less)	RANDOM fig.	Vibration time	X, Y, Z each 40hours	X, Y, Z each 40hours	X, Y, Z each 8hours	Connector attaching method	Test Mode A, B, C	Test Mode A, E, G	Test Mode D, F
		Division	Condition (Nonsealed CONNECTOR)	Condition (Sealed CONNECTOR)																																			
				SINE TEST		RANDOM TEST																																	
		Ambient temperature/humidity	80°C, 90~95%	120°C		120°C																																	
		Applied current	Basic current (Connect electrodes in series.)	Basic current (Connect electrodes in series.)		Basic current (Connect electrodes in series.)																																	
		Current application cycle	120 CYCLE (45min.-ON, 15min.-OFF)	120 CYCLE (45min.-ON, 15min.-OFF)		24 CYCLE (45min.-ON, 15min.-OFF)																																	
		Vibration acceleration	4.4G	SINE fig.		RANDOM fig.																																	
		Frequency	20Hz ~ 200Hz (SWEEP TIME ~ 3MIN or less)	20Hz ~ 200Hz (SWEEP TIME ~ 3MIN or less)		RANDOM fig.																																	
		Vibration time	X, Y, Z each 40hours	X, Y, Z each 40hours		X, Y, Z each 8hours																																	
		Connector attaching method	Test Mode A, B, C	Test Mode A, E, G		Test Mode D, F																																	
Crimp Tensile Strength	0.3SQ:Min. 6kgf																																						
	0.5SQ:Min. 9kgf																																						
	0.75SQ:Min. 11kgf																																						
	1.25SQ:Min. 17kgf																																						
	2.5SQ:Min. 25kgf																																						
3.0SQ:Min. 35kgf																																							
Voltage Drop	2.8mm	Max 10mV/A																																					
	1.2mm																																						
Temperature Rise	025 (0.75SQ)	Max 40°C																																					
	060 (0.75SQ)																																						
	110 (3.0SQ)																																						
Electrical Discontinuity	Max 10 μs & Min 3.5V																																						
Waterproof Test	Min 0.5kgf/cm²																																						

Test items	Appearance	Connector engage and disengage force	Reverse insertion Between housings	Contact to HSG Inverse Force	Engage force between terminal and housing	Strength of HSG LOCK	HSG LOCK release force	Terminal retention force	Climp strength	Voltage drop	Insulation resistance	Leakage current	High voltage	Temperature rise	Instant short circuit	Sealing
Initial test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Twisting test	<input type="checkbox"/>									<input type="checkbox"/>						
Connector engage/ disengage endurance test	<input type="checkbox"/>									<input type="checkbox"/>						
Cold temperature test	<input type="checkbox"/>									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Cold and hot temperature shock test	<input type="checkbox"/>									<input type="checkbox"/>						<input type="checkbox"/>
High temperature test	<input type="checkbox"/>									<input type="checkbox"/>						<input type="checkbox"/>
Temperature and humidity test	<input type="checkbox"/>									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
Dust test										<input type="checkbox"/>						<input type="checkbox"/>
Waterproof test(for waterproof connector)	<input type="checkbox"/>										<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
Oil and liquid test	<input type="checkbox"/>									<input type="checkbox"/>						<input type="checkbox"/>
Ozone test	<input type="checkbox"/>									<input type="checkbox"/>						<input type="checkbox"/>
Salt water test(for waterproof connector)	<input type="checkbox"/>									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
Sulfur test	<input type="checkbox"/>									<input type="checkbox"/>						<input type="checkbox"/>
Composite Environmental Vibration/ Mechanical test	<input type="checkbox"/>								<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part Number	Descriptions
See interface 2005381-2,2188620-2	Male connector, 100-Pin (68Pos + 32Pos)
2005210-2	ASS'Y 68 POS. CONNECTOR
2005215-6	MQS RETAINER HSG FOR 68P
2005216-6	MCP 2.8 RETAINER HSG
2005217-2	ASS'Y 32 POS. CONNECTOR
2005222-6	MQS RETAINER HSG FOR 32P
968220 (2005119)	MQS 0.63 Clean Body contact, WSR ¹ 0.35-0.5mm ²
968221 (2005120)	MQS 0.63 Clean Body contact, WSR ¹ 0.5-0.75mm ²
1452158	MQS 1.5 Clean Body contact, WSR ¹ 0.5mm ²
1241608	MQS 1.5 Clean Body contact, WSR ¹ 0.75-1.5mm ²
968855	AMP MCP2.8, SWS, WSR ¹ 0.5-1.0mm ²
968857	AMP MCP2.8, SWS, WSR ¹ 1.5-2.5mm ²
968859	AMP MCP2.8, SWS, WSR ¹ 3.0mm ²
1897421-2	BLIND PLUG FOR MQS 0.63
1897422-1	BLIND PLUG FOR MQS 1.5
828922-1	BLIND PLUG FOR MCP 2.8 FOR DIA. 5.4
828986-1	BLIND PLUG FOR MQS 1.5 FOR DIA. 6.4
828904-1, 828905-1, 828985-1 (cavity plug) (various wire cross- section, see the drawing of the individual seal)	Single wire seal for AMP MCP2.8

- The 196-Pin plug connector is used for the connection of engine control units inside the vehicle and also at various installation locations in the engine compartment. On the cable side, the system has a modular design, permitting the connection of a separate engine and/or vehicle cable harness.