040II/070II Hybrid I/O Connector MK-II for Wire-to-Board Termination

1. Scope :

1.1 Contents :

This specification covers the requirements for product performance, test methods and quality assurance provisions of 040Ⅱ/070 Ⅱ Hybrid I/O Connector MK-Ⅱ for Wire-to-Board Termination.
Applicable product descriptions and part numbers are as shown in Appendix 1.

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.

2.1 TE Specifications :

A. 109-5000: Test Specification, General Requirements for Test Methods. Application Specification

B. 114-5159 : Crimping 040 Ⅱ Series Receptacle & Tab Contact
114-5160 : Crimping 070 Ⅱ Series Receptacle & Tab Contact
114-5198 : Crimping 070 Ⅲ(Unsealed) Receptacle Contact
501-5303 : Test Report

2.2 Commercial Standards and Specifications :

A. JASO D605 Multi-pole Connector for Automobiles

B. JASO D7101 Test Methods for Plastic Molded Parts

C. JIS C3406 Low Voltage Wires and Cables for Automobiles

D. JIS D0203 Method of Moisture, Rain and Spray Test for Automobile Parts

E. JIS D0204 Methods of High and Low Temperature Test for Automobile Parts

F. JIS D1601 Vibration Testing Method for Automobile Parts

G. JIS R5210 Portland Cement

H. MIL-STD-202 Testing Method 208: Method of Soldering

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3. Requirements :

3.1 Design and Construction:

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

3.2 Materials :

A. Contact :

a. Receptacle Contact : Pre-Tin Brass or Pre-tin Phosphor Bronze, or Plain Brass with Selective Gold plating over nickel under plating, or plain Phosphor Bronze with Selective Gold plating over nickel under plating.

b. Tab Contact : Pre-Tinned Brass or Selective-Tin
Plain Brass with Selective Gold plating over nickel under plating.

B. Housing : PBT resin

3.3 Ratings :

Temperature Rating: -30℃ to 105℃

3.4 Performance and Test Descriptions:

The product shall be designed to meet the electrical, mechanical and environmental performance requirements.
specified in Fig.2. All tests shall be performed in the room temperature, unless otherwise specified.

3.5 Test Requirements and Procedures Summary ：

Para.	Test Items	Requirements	Procedures
3.5.1	Confirmation of Product	Product shall be conforming to the requirements of applicable product drawing and Application Specification. No. 114-5159, 114-5160	Visually, dimensionally, and functionally inspected per applicable quality inspection plan.
Electrical Requirements			
3.5.2	Termination Resistance (Specified Current)	(040Ⅱ) 10mΩMax. (Initial) 20mΩMax. (Final) (070Ⅱ,Ⅲ) 3mΩMax. (Initial) 10mΩMax. (Final)	Measure initial millivolt drop of contact test circuit in mated connectors, Fig.3
3.5.3	Termination Resistance (Low Level)	(040Ⅱ) 10mΩMax. (Initial) 20mΩMax. (final) (070Ⅱ,Ⅲ) 3mΩMax. (Initial) 10mΩMax. (final)	Subject mated contacts assembled in housing to closed circuit current of 10mA Max. at open circuit voltage of 20mVMax. Fig.3.
3.5.4	Dielectric Strength	No creeping discharge nor flashover shall occur.	1kVAC for 1 minute. Test between adjacent circuits of mated/unmated connectors.
3.5.5	Insulation Resistance	100MΩMin.	Impressed voltage 500V DC. Test between adjacent circuits of mated connectors.
3.5.6	Current Leakage	1mA Max.	12V DC impressed 1min.
3.5.7	Temperature Rising	60℃Max. under loaded specified current.	Measure temperature rising by energized current.
3.5.8	Current Cycling	(040 Ⅱ) 20mΩMax. (Final) (070 Ⅱ,Ⅲ) 10mΩMax. (Final) No ignition is allowed during the test.	Applied Current : Fig 6 & 7. 45minutes “ON”, 15minutes “OFF” 200 cycles.

Fig. 1 (To be continued)

<table>
<tr><th colspan="6">Physical Requirements</th></tr>
<tr><th>Para.</th><th>Test Items</th><th>Requirements</th><th colspan="3">Procedures</th></tr>
<tr><td rowspan="4">3.5.9</td><td rowspan="4">Vibration(High Frequency)</td><td rowspan="4">No electrical discontinuity greater than 1μsec. Shall occur.
(040Ⅱ) 20mΩ Max.(Final)
(070Ⅱ,Ⅲ) 10mΩ Max.(Final)</td><td colspan="3">Vibration Frequency :
20～200～20Hz/3min.
Accelerated Velocity :
44.1m/s² (4.5G)</td></tr>
<tr><td>Vibration Direction</td><td>Up and Down</td><td>Back and Forth</td><td>Right and Left</td></tr>
<tr><td>Direction</td><td>4 hours</td><td>2 hours</td><td>2 hours</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="5">3.5.10</td><td rowspan="5">Vibration + Current Cycle</td><td rowspan="5">No electrical discontinuity greater than 1μsec. Shall occur.
(040Ⅱ) 20mΩ Max.(Final)
(070Ⅱ, Ⅲ) 10mΩ Max.(Final)</td><td colspan="3">Vibration Frequency :
20～200～20Hz/3min.
Accelerated Velocity :
44.1m/s² (4.5G)</td></tr>
<tr><td>Vibration Direction</td><td>Up and Down</td><td>Back and Forth</td><td>Right and Left</td></tr>
<tr><td>Direction</td><td>4 hours</td><td>2 hours</td><td>2 hours</td></tr>
<tr><td colspan="4">Test Current : (040 Ⅱ) 4.4A DC
(070 Ⅱ,Ⅲ) 10A DC</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>3.5.11</td><td>Contact Mating Force</td><td>040 Ⅱ Series : 5.8N Max.
070 Ⅱ,Ⅲ Series : 5.8N Max.</td><td colspan="3">Operation Speed : 100mm/min. Measure the force required to mate contacts.</td></tr>
<tr><td>3.5.12</td><td>Contact Unmating Force</td><td>040 Ⅱ Series : 0.98N Min. (Sn)
0.69N Min. (Au)
070 Ⅱ,Ⅲ Series : 0.98N Min. (Sn)
0.69N Min. (Au)</td><td colspan="3">Operation Speed : 100mm/min. Measure the force required to unmate contacts.</td></tr>
<tr><td>3.5.13</td><td>Connector Mating Force</td><td>12Pos. 69N Max.
16Pos. 69N Max.
22Pos. 88.3N Max.
26Pos. 98.1N Max.</td><td colspan="3">Operation Speed : 100mm/min. Measure the force required to mate contacts.</td></tr>
<tr><td>3.5.14</td><td>Connector Unmating Force</td><td>12Pos. 69N Max.
16Pos. 69N Max.
22Pos. 88.3N Max.
26Pos. 98.1N Max.</td><td colspan="3">Operation Speed : 100mm/min. Measure the force required to unmate contacts.</td></tr>
<tr><td>3.5.15</td><td>Housing Locking Strength</td><td>98N Min.</td><td colspan="3">Measure housing locking strength.
Operation Speed : 100mm/min.</td></tr>
<tr><td>3.5.16</td><td>Contact Insertion Force</td><td>9.8N Max. per contact</td><td colspan="3">Measure the force required to insert contacts into housing.</td></tr>
</table>

Fig. 1 (To be continued)

Para.	Test Items	Requirements			Procedures
3.5.17	Contact Retention Force (Pre-Lock)	49N Min.			Apply an axial pull-off load to crimped wire. Operation Speed: 100mm/min.
3.5.18	Contact Retention Force (Secondary Lock)	78N Min.			Measure contact retention force with secondary lock set in effect. Operation Speed: 100mm./min.
3.5.19	Crimp Tensile Strength	Wire Size		Crimp Tensile	Apply an axial pull-off load to crimped wire of contact secured on the tester. Operation Speed: 100mm/min.
		mm^2	(AWG)	N	
		0.3	#22	58 min.	
		0.5	#20	88 min.	
		0.85	#18	127 min.	
		1.25	#16	177 min.	
3.5.20	Durability (Repeated Mate/Unmating)	(040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)			Operation Speed: 100mm/min. No. of Cycles: 30 Cycles.
3.5.21	Resistance to "Kojiri"	(040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)			Repeated mating/ unmating by hand, 30 cycles
3.5.22	Solderbility	Wet Solder Coverage: 95% Min. (Plated Area only)			Solder Temperature: 230±5℃ Immersion Duration: 3±0.5 seconds Flux: Alpha 100
					Matte Tin plating only Solder bath : Sn-3Ag-0.5Cu Solder Temperature :250±5℃ Immersion Duration :5±0.5sec. Flux :ULF-300R
3.5.23	Handling Ergonomic	No abnormalities allowed in manual mating/unmating handling.			Manually operated
3.5.24	Double Lock Plate Locking Strength	59N Max.			Operation Speed: 100mm/min. Measure the force required to lock the double lock plate.

Fig. 1 (To be continued)

Environmental Requirements			
Para.	Test Items	Requirements	Procedures
3.5.25	Thermal Shock	(040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)	-30℃/120min, 80℃/120min. Making this a cycle, repeat 5 cycles.
3.5.26	Humidity, Steady State	Insulation resistance (Final) 100MΩ Min. Termination resistance (040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)	Mated/unmated Connector, 90～95% R.H., 60℃ 96 hours
3.5.27	Industrial Gas (SO_2)	(040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)	SO_2 Gas : 10ppm, 95% R.H. 20℃, 24 hours
3.5.28	Temperature Life (Heat Aging)	(040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)	120℃, Duration: 120 hours
3.5.29	Resistance to Cold	(040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)	-50℃±5℃, 120 hours
3.5.30	Dust Bombardment	(040Ⅱ) 20mΩ Max.(Final) (070Ⅱ,Ⅲ) 10mΩ Max.(Final)	Subject JIS R5210 cement blow of 1.5kg per 10 seconds in 15 minutes intervals for 90 minutes.

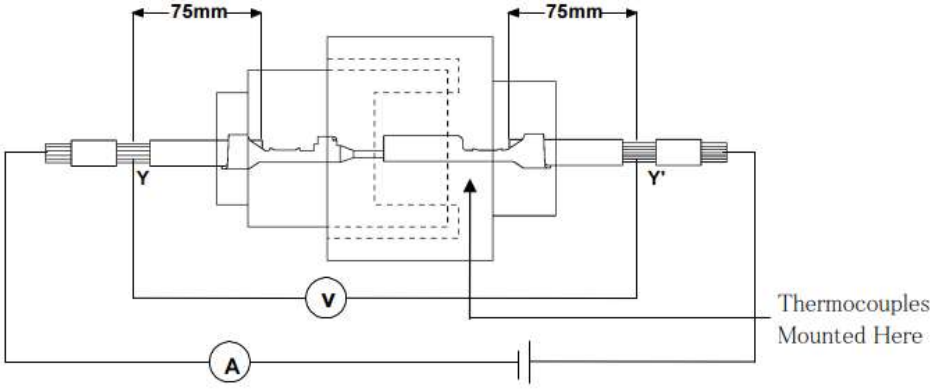
Fig.1 (End)

4. Product Qualification Test Sequence

Test Items	Test Group										
	1	2	3	4	5	6	7	8	9	10	11
	Test Sequence (a)										
Confirmation of Product	1	1	1	1	1,9	1,11	1,11	1,13	1,16	1,11	1
Termination Resistance (Specified Current)			4								
Termination Resistance (Low Level)			3		3,5,7	3,6,8	3,6,8	3,6, 8,10	2,7, 9,14	3,6,8	
Dielectric Strength				3					4,12		
Insulation Resistance				2					3,11		
Current Leakage				4					5,10		
Temperature Rising			5								
Current Cycling								9			
Vibration (High Frequency)								7			
Vibration + Current Cycle										7	
Contact Mating Force	2										
Contact Unmating Force	3										
Connector Mating Force			2			2,10	2,10	2,12		2,10	
Connector Unmating Force			6			4,9	4,9	4,11		4,9	
Housing Locking Strength		2									
Contact Insertion Force											2
Contact Retention Force(Pre-Lock)											3
Contact Retention Force(Secondary Lock)			7								
Crimp Tensile Strength	4										
Durability(Repeated Mate/Unmating)									6		
Resistance to “Kojiri”							5	5		5	
Solderability					2						
Handling Ergonomics					8				15		
Double Lock Plate Locking Strength											4
Thermal Shock					4						
Humidity, Steady State					6				8		
Industrial Gas (SO_2)									13		
Temperature Life(Heat Aging)						5					
Resistance to Cold						7					
Dust Bombardment							7				

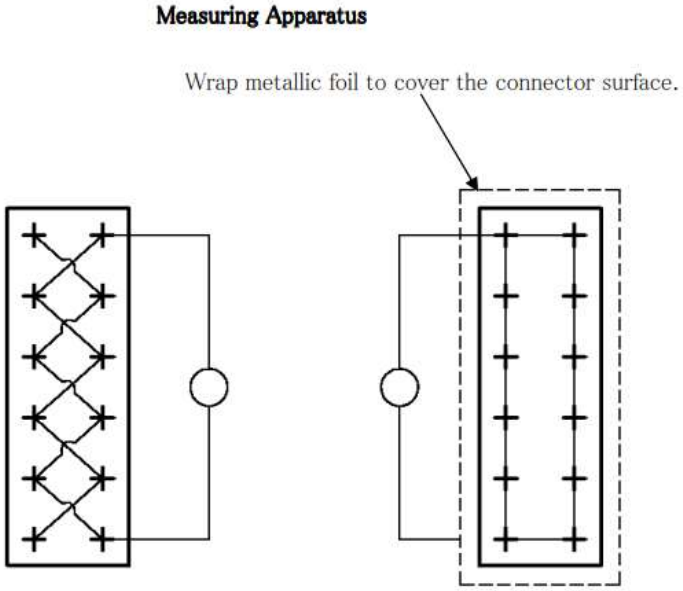
Fig. 2

(a) Numbers indicate sequence in which tests are performed.



From the measured readings, deduct the resistance of the 150mm long wire used for termination. When testing for rated current measurement, apply 12V DC, 1A to the circuit. For obtaining uniformity of the current density on the probing points Y-Y', apply soldering on the probing points prior to testing.

Fig.3 Measurement of Termination Resistance



Between the Adjacent Contacts Between the Contacts and Housing

Fig.4

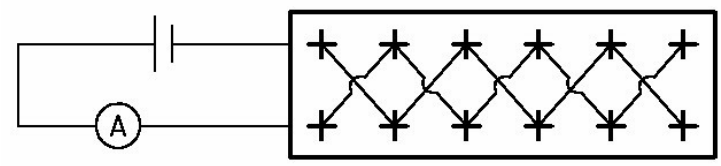


Fig.5

Maximum Allowable Current (I max.)

Wire Size (mm^2)	Allowable Current (DC A)
0.3	8
0.5	11
0.85	15
1.25	19
2.0	25

Fig.6

Reduction Coefficient (Kd)

Number of Energized Contacts	Reduction Coefficient
1	1
2～3	0.75
4～5	0.6
6～8	0.55
9～12	0.5
13～	0.4

Fig.7

(1) $I_1 = Kd \cdot I_{max}$ ・・・・・・・・・Current applied to all positions

(2) $I_2 = I_{max}$ ・・・・・・・・・・・ Current applied to every other positions in multiple connector

Wire Size (mm^2)	Test Method Ⅰ		Test Method Ⅱ	
	Test Current (A)	Duration (Minutes)	Test Current (A)	Duration (Seconds)
0.3	25	5	50	5
0.5	30		80	
0.85	40		110	
1.25	45		170	
2.0	70		250	

Fig.8

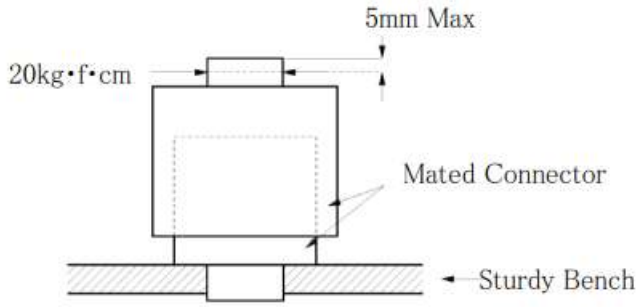


Fig.9

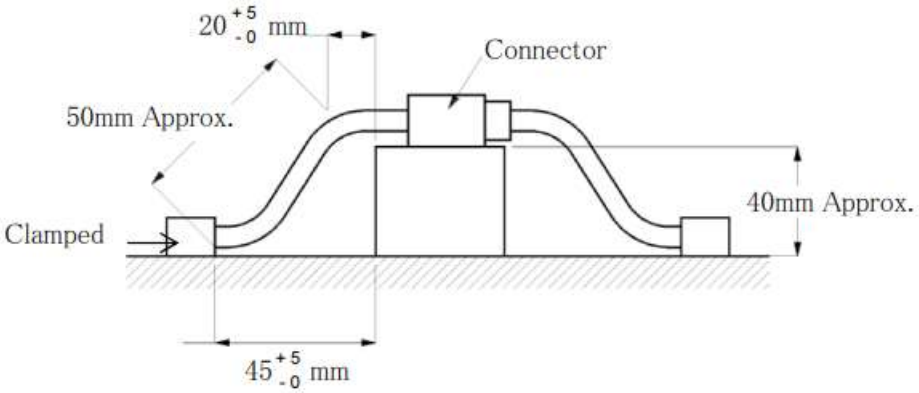


Fig.10

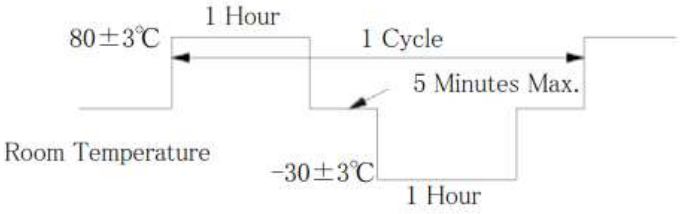


Fig.11

The applicable product descriptions and part numbers are as shown in Appendix 1.

Appendix 1

Prod. P/N	Description
X-178845-X	040/070 Hybrid I/O Conn. MK-Ⅱ 12Pos. Plug Housing. Assembly (Signal)
X-178881-X	040/070 Hybrid I/O Conn. MK-Ⅱ 12Pos. Plug Housing. Assembly (Power)
X-178795-X	040/070 Hybrid I/O Conn. MK-Ⅱ 16Pos. Plug Housing. Assembly
X-178883-X	040/070 Hybrid I/O Conn. MK-Ⅱ 16Pos. Plug Housing. Assembly
X-177545-X	040/070 Hybrid I/O Conn. MK-Ⅱ 16Pos. Plug Housing. Assembly
X-178798-X	040/070 Hybrid I/O Conn. MK-Ⅱ 22Pos. Plug Housing. Assembly
X-178801-X	040/070 Hybrid I/O Conn. MK-Ⅱ 26Pos. Plug Housing. Assembly
X-178885-X	040/070 Hybrid I/O Conn. MK-Ⅱ 26Pos. Plug Housing. Assembly
X-178888-X	040/070 Hybrid I/O Conn. MK-Ⅱ 26Pos. 3Row Plug Housing. Assembly
X-178897-X	040/070 Hybrid I/O Conn. MK-Ⅱ 26Pos. 3Low Profile Plug Housing. Assembly
X-917978-X	040/070 Hybrid I/O Conn. MK-Ⅱ 12Pos. Plug Housing. Assembly (Signal)
X-917975-X	040/070 Hybrid I/O Conn. MK-Ⅱ 12Pos. Plug Housing. Assembly (Power)
X-917981-X	040/070 Hybrid I/O Conn. MK-Ⅱ 16Pos. Plug Housing. Assembly
X-917989-X	040/070 Hybrid I/O Conn. MK-Ⅱ 22Pos. Plug Housing. Assembly
X-917992-X	040/070 Hybrid I/O Conn. MK-Ⅱ 26Pos. Plug Housing. Assembly
X-175571-X	040/070 Hybrid I/O Conn. 26Pos. Cap Housing. Assembly
X-178811-X	040/070 Hybrid I/O Conn. 26Pos. Cap Housing. Assembly
X-175569-X	040/070 Hybrid I/O Conn. 26Pos. Cap Housing. Assembly
X-178762-X	040/070 Hybrid I/O Conn. 26Pos. Cap Housing. Assembly
X-5178762-X	
X-176206-X	040/070 Hybrid I/O Conn. 26Pos. 3Row Cap Housing. Assembly
X-178900-X	040/070 Hybrid I/O Conn. 26Pos. 3Row Low Profile Cap Housing. Assembly
X-178209-X	040/070 Hybrid I/O Conn. 26Pos. Low Profile Cap Housing. Assembly
X-175444-X	040/070 Hybrid I/O Conn. 34Pos. Cap Housing. Assembly
X-5175444-X	
X-176255-X	040/070 Hybrid I/O Conn. 34Pos. Cap Housing. Assembly (30 Pos.)
X-175521-X	040/070 Hybrid I/O Conn. 38Pos. Cap Housing. Assembly

Prod. P/N	Description
X-178093-X	040/070 Hybrid I/O Conn. 38Pos. Cap Housing. Assembly
X-353245 –X	040/070 Hybrid I/O Conn. 38Pos. Cap Housing. Assembly (V-Type)
X-175446-X	040/070 Hybrid I/O Conn. 42Pos. Cap Housing. Assembly
X-5175446-X	
X-176242-X	040/070 Hybrid I/O Conn. 42Pos. Cap Housing. Assembly
X-177542-X	040/070 Hybrid I/O Conn. 42Pos. Cap Housing. Assembly
X-174917-X	040/070 Hybrid I/O Conn. 48Pos. Cap Housing. Assembly
X-5174917-X	
X-175448-X	040/070 Hybrid I/O Conn. 54Pos. Cap Housing. Assembly
X-1318471-X	040/070 Hybrid I/O Conn. 54Pos. Cap Housing. Assembly without 16Pos.
X-174518-X	040/070 Hybrid I/O Conn. 64Pos. Cap Housing. Assembly
X-5174518-X	
X-178764-X	040/070 Hybrid I/O Conn. 64Pos. Cap Housing. Assembly
X-177609-X	040/070 Hybrid I/O Conn. 64Pos. Cap Housing. Assembly
X-176122-X	040/070 Hybrid I/O Conn. 64Pos. Cap Housing. Assembly
X-174915-X	040/070 Hybrid I/O Conn. 76Pos. Cap Housing. Assembly
X-176142-X	040/070 Hybrid I/O Conn. 76Pos. Cap Housing. Assembly
X-178780-X	040/070 Hybrid I/O Conn. 76Pos. Cap Housing. Assembly
X-353468-X	040/070 Hybrid I/O Conn. 76Pos. Cap Housing. Assembly
X-353469-X	040/070 Hybrid I/O Conn. 76Pos. Cap Housing. Assembly
X-175265-X	040Ⅱ S Receptacle Contact (Pre-Tin)
X-175266-X	040Ⅱ S Receptacle Contact (Selective Gold)
X-175268-X	070Ⅱ S Receptacle Contact (Pre-Tin)
X-175275-X	070Ⅱ S Receptacle Contact (Selective Gold)
X-175269-X	070Ⅱ M Receptacle Contact (Pre-Tin)
X-175276-X	070Ⅱ M Receptacle Contact (Selective Gold)
X-1318629-X	070Ⅲ ML Receptacle Contact (Pre-Tin)

※ Note: Parts number is consisted from listed base number and 1 digit numeric prefix and suffix with dash.
Refer to catalog or customer drawing for specific part numbers for each base number. When prefix is zero, zero and dash are omitted.