8-AX Contacts

Objectives:

The purpose of this document is to define a size 8 “8-AX” high speed copper contact for the air transport industry. The goal is to provide a 10GBASE-T interconnect solution in a widely popular size 8 form factor contact.

This will make 10GBASE-T retrofit, upgrade and new designs easy by combining with many existing inserts of the most popular connectors series.

Scope

This section is intended to provide standardization of the design and fabrication of an 8-AX contact.

A Size 8 multi-pin contact called “8-AX” into which eight signal pins are included and provide a one 10GBASE-T Ethernet port per contact is described in this document.

Note: The target application for the 8-AX contact is 10GBASE-T links, although it can be used for lower speed like 1000BASE-T applications.

Benefits

The use of 8-AX size 8 contact provides benefits such as:

- Up to 10GBASE-T with only 1 contact
- Replace 2 quadrax contacts necessary to achieve 10GBASE-T Ethernet link by 1 single 8-AX contact.
- Reduce size of connector shells
- Reduce overall weight of cable harness
- Offer the possibility of 2 quadrax links into one single 8-AX contact.

Key Characteristics:

The 8-AX employs a reverse gender construction VS the quadrax contacts.

The 8-AX is the ‘pin-type’ outer shell, contains eight ‘socket’ signal contacts. The 8-AX with the ‘socket-type’ outer shell, contains eight ‘pin’ signal contacts.

The 8-AX, just like the quadrax contact, and for the same reasons related to the design of the connectors into which they are mounted, is available in two versions:

Type 1: compatible with ARINC 600 series, EN4644 and EN3545 series.

Type 2: compatible with MIL-DTL-38999, EN4165

Dimensional details, as well as applicable tests and qualification procedures relevant for each version are also described here.

Contact Design:

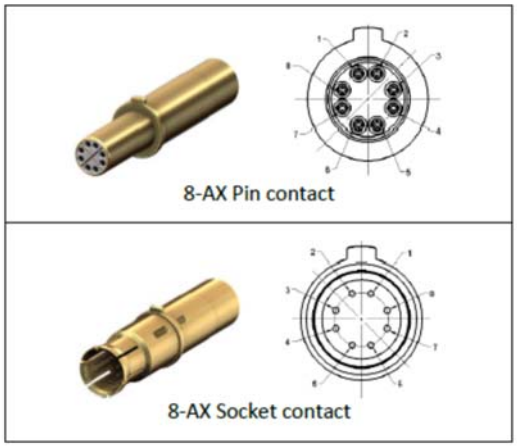
The Type 1 and Type 2 version are both size 8 contacts. They are differentiated by part numbers and physically by the coding key that provides anti-rotation of the contact inside the connector's cavity.(See drawings below for details)

The 8-AX contact does not support termination to wires larger than 26AWG.

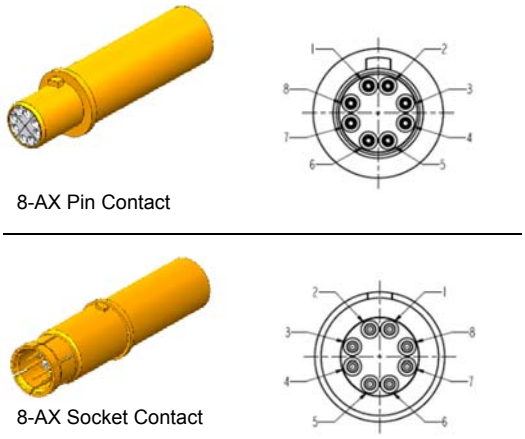
All equipment using the 8-AX contact for 10GBASE-T or 1000BASE-T should use the standard pin allocation illustrated in Figure TBD. Refer to A664 Part 2 for 10GBASE-T and 1000BASE-T applications for signal name to contact pin assignments. Wire implementation guidelines are included in A664 Part 2.

Due to the small size of the 8-AX contact, there are no physical markings on the contact body that denote the numbering of the eight signal pins. This requires the users to be reliant on supporting documentation to identify the location of the signal pins 1 thru 8.

Type 1: ARINC 600, EN4644, EN3545 compliant.



Type 2: MIL-DTL-38999, EN4165 compliant.



Defining Contact Type with regards to Reverse Gender type.

Most connector types allow the use of either a pin or socket 8-AX contact in both the plug and receptacle connector. However, some connector series have limited options (i.e., the plug connector will only accommodate sockets, and the receptacle will only support pins). The system integrator must consider these limitations when specifying the connectors used.

Key Characteristics

1- Specific characteristics

Contact with screening feature, including coaxial, triaxial, bifilar, quadrax and 8-AX contacts are contacts with screening feature and specified high frequency characteristics, class R corresponds to an operating temperature range from -65°C to +150°C as per EN3155.

2- Dimensions and mass

2-1 See Figure 1 and 2 for dimensions. Dimensions and tolerances are given in millimeters.

Type 1 ARINC version:

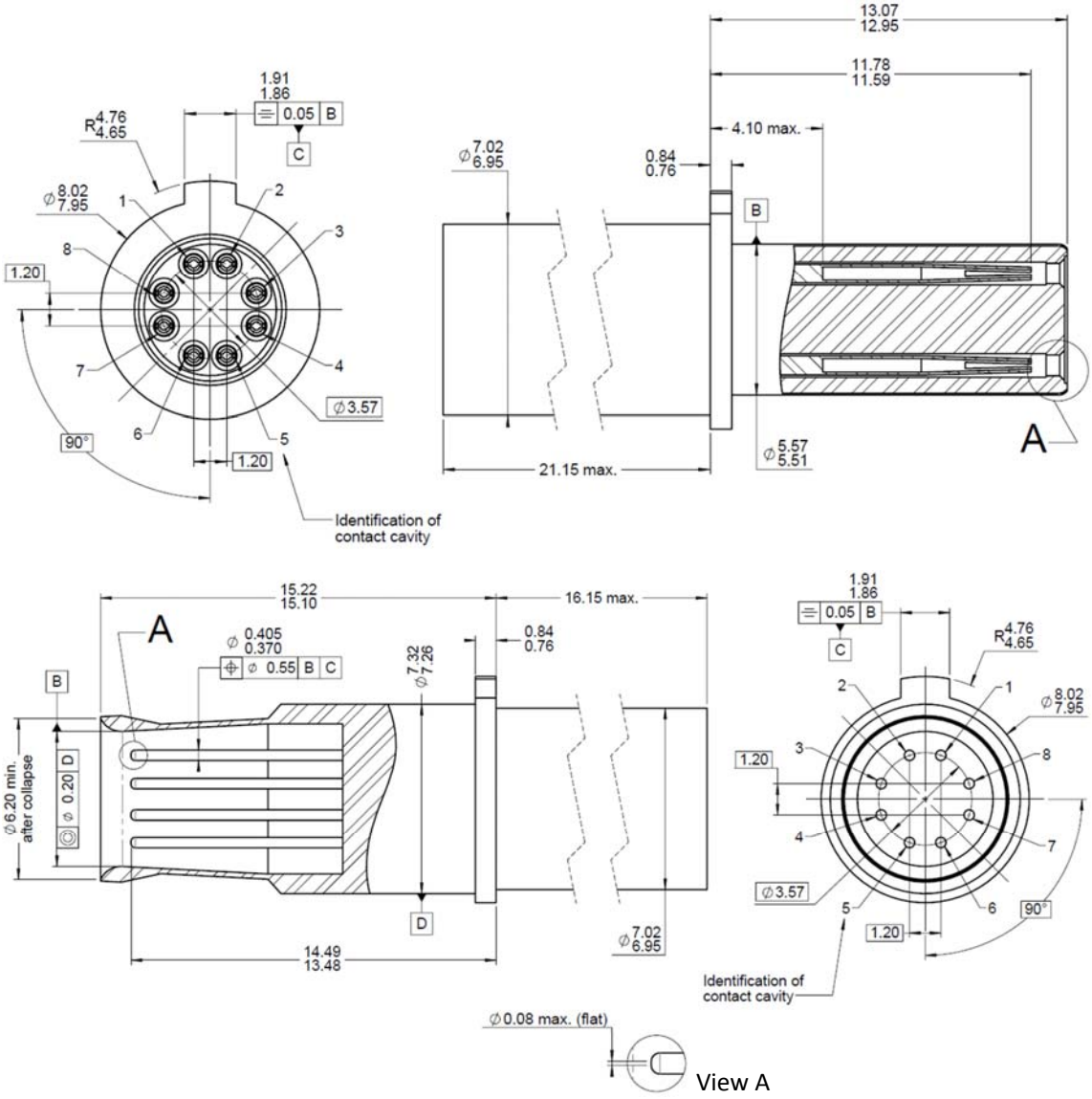


Figure 1: Type 1 “8-AX” contact

Type 2 EN4165/ MIL-DTL-38999 version:

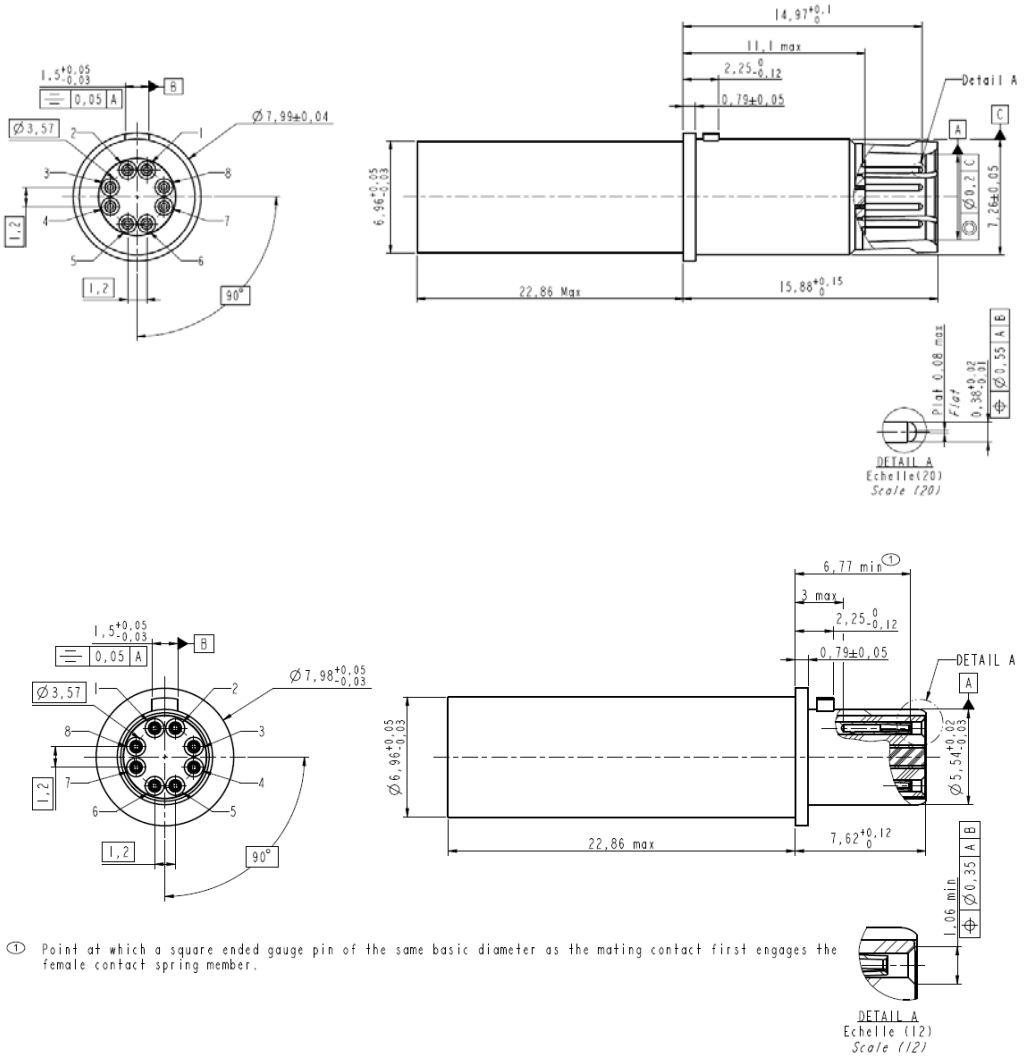


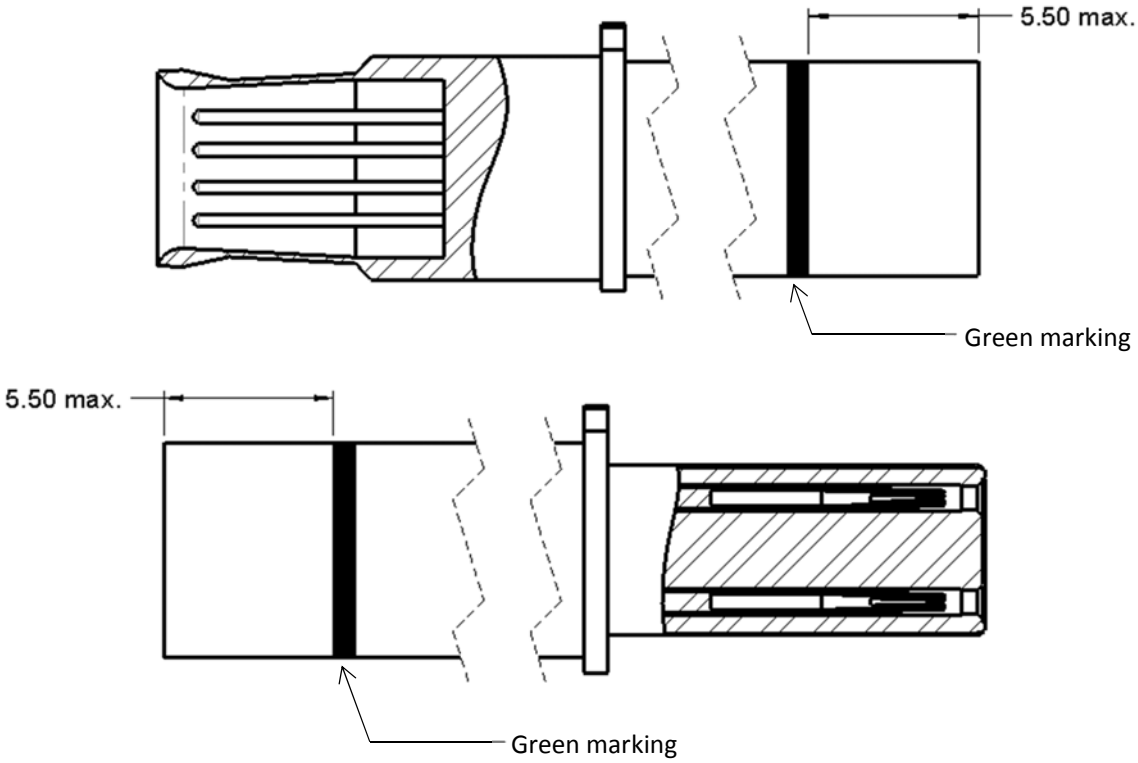
Figure 2: Type 2 “8-AX” contacts

2-2 Mating durability: 500 mating cycles

2-3 Contact mass: approx. 10 g max.

3 Pin Location and Marking of 8-AX contacts

3.1 Size 8 outer contact body: Marking by color code



3.2 Pin location identification

Due to the small size of the 8-AX contact, there are no physical markings on the contact body that denote the numbering of the eight signal pins. This requires the users to be reliant on supporting documentation to identify the location of the signal pins 1 thru 8.

Figure 3

4 Material, surface treatment

4.1 Material

Body: Copper alloy.

4.2 Protective coating

Gold on appropriate undercoat for copper alloy parts.
Thickness not specified.

4.3 Dielectric

PTFE Fluoropolymer or equivalent.

5 Permissible cables

The cable to be used with the 8-AX contacts is the one defined as Cat6A (4 Pair) 26 AWG Data cable in accordance with ARINC 800 Part 3 Section 4.1.5.

6 Tools

6-1 Crimping tools are defined here below for reference. See Table 3.

Contact size	Wire size (AWG)	Crimping tool	Positioner
8	26	Center contact: M22520/2-01 Outer Body: M22520/5-01	Center contact: TBD Outer Body: M22520/5-45

Table 3

6-2 Insertion and extraction tools: see Table 4.

	Insertion and extraction tool
Contact 8-AX Type 1	M81969/14-06

	Insertion and extraction tool
Contact 8-AX Type 2	M81969/14-12

Table 4

7 Applicable Qualification Tests7. 1 Qualification Tests according to EN 2591-100

<table>
<tr><th rowspan="2">EN 2591-</th><th rowspan="2">Test</th><th rowspan="2">Not applicable</th><th colspan="2">Applicable</th></tr>
<tr><th>According to EN 3155-001</th><th>Remarks</th></tr>
<tr><td>101</td><td>Visual examination</td><td></td><td>X</td><td></td></tr>
<tr><td>102</td><td>Examination of dimensions and mass</td><td></td><td>X</td><td>10g max</td></tr>
<tr><td>201</td><td>Contact resistance - low level</td><td></td><td>X</td><td>With WL Gore cable
<table><tr><th rowspan="2">Contact</th><th colspan="2">Maximum contact resistance
mΩ</th></tr><tr><th>Initial</th><th>After tests</th></tr><tr><td>signal</td><td>8</td><td>10</td></tr><tr><td>Outer</td><td colspan="2">Not applicable</td></tr></table>The measurement should be done at a 30cm distance.</td></tr>
<tr><td>202</td><td>Contact resistance at rated current</td><td></td><td>X</td><td>With Gore cable
<table><tr><th rowspan="3">Contact</th><th rowspan="3">Test current
A</th><th colspan="3">Maximum contact resistance
mΩ</th></tr><tr><th colspan="2">Room temperature</th><th>Max. temperature</th></tr><tr><th>Initial</th><th>After cond.</th><th>150 °C</th></tr><tr><td>signal</td><td>1</td><td>8</td><td>10</td><td>12</td></tr><tr><td>Outer</td><td>12</td><td>2</td><td>4</td><td>6</td></tr></table></td></tr>
<tr><td>204</td><td>Discontinuity of contacts in the microsecond range</td><td></td><td>X</td><td>Method B:
Interruption □ 2 ns during tests EN 2591-402 and EN 2591-403.</td></tr>
<tr><td>205</td><td>Housing (shell) electrical continuity</td><td></td><td>X</td><td>Measurements between housing of connectors and outer contact before and after tests.
Requirement: 10mΩ max</td></tr>
<tr><td>206</td><td>Measurement of insulation resistance</td><td></td><td>X</td><td>Method C, mated contacts
Measurements between signal Contacts and between signal contacts and outer body.
At ambient temperature:
≥ 5 000 MΩ
At maximum temperature:
≥ 1 000 MΩ at maximum specified temperature</td></tr>
<tr><td>207</td><td>Voltage proof test</td><td></td><td>X</td><td>Method C
Withstand voltage at sea level:
1 000 Vr.m.s. between signal contacts and
500 Vr.m.s. between signal contacts and outer body
Withstand voltage at altitude:
125 Vr.m.s. at a pressure of 4,7 kPa (21 000 m)
Leakage current: 2 mA</td></tr>
<tr><td>210</td><td>Electrical overload</td><td>X</td><td></td><td></td></tr>
<tr><td>211</td><td>Capacitance</td><td>X</td><td></td><td></td></tr>
</table>

212	Surface transfer impedance	X		
222	Insertion Loss (I.L.)			
223	Measurement of characteristic impedance of a coaxial connector or contact		X	(100 ± 10) Ω at 100 MHz
301	Endurance at temperature		X	Method B T = 200 °C Duration: 1 000 h
305	Rapid change of temperature		X	Contacts wired and engaged: T_A = (200 ± 2) °C T_B = (− 65 ± 2) °C
306	Mould growth		X	
307	Salt mist		X	
315	Fluid resistance		X	See Table 6.
402	Shock		X	To be done at connector performance level
403	Sinusoidal and random vibration		X	To be done at connector performance level
406	Mechanical endurance		X	500 cycles
415	Test probe damage		X	Pin only
416	Contact bending strength	X		
417	Tensile strength (crimped connection)		X	Centre 45N Outer 110N
418	Gauge insertion/extraction forces (female contacts)		X	Gauge: As defined in Figure 4 and Table 7.

Contact	**Insertion** (max.)		**Extraction** (min.)	
	Initial	**After Cond.**	**Initial**	**After Cond.**
Centre	3,33N	3,89N	0.14N	0.11N
Outer type 1	5N	N.A	1.20N	0.80N
Outer type 2	13.6N	17N	0.85N	0.57N

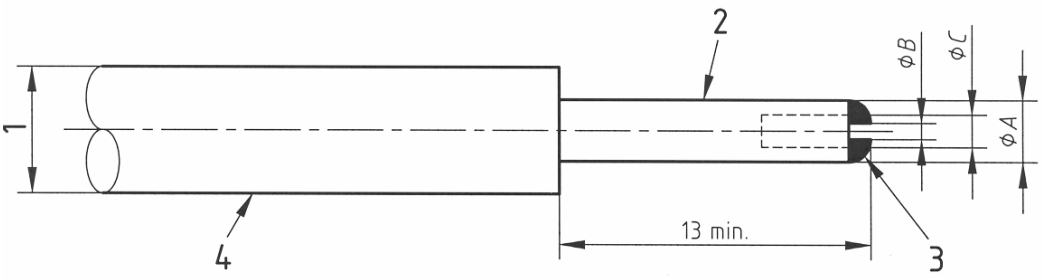
503	Contact deformation after crimping		X	Cable size in accordance with –Signal contacts concentricity tolerance shall not exceed 0.28. – Signal contacts and outer body. Crimping zone shall not exceed 0.15 mm expansion.
507	Plating porosity		X	
508	Measurement of thickness of coating on contacts		X	The measured thickness to be recorded under X length.
513	Magnetic permeability		X	

Table 6

Fluide		**Immersion**		**Stoving**	**Number of cycles**
Category	**EN3909** NUMBER	Duration min	Temp. °C	Temp. °C	
Fuel	2	96h	25	15	3
Mineral hydraulic fluid	3	15^{+5}_{0}	85	100	1
Mineral lubricant	7	15^{+5}_{0}	120	125	1
Synthetic lubricant	9	15^{+5}_{0}	150	125	5
Cleaning products	11	15^{+5}_{0}	25	25	5
	13	15^{+2}_{0}			
De-icing fluid	15	15^{+5}_{0}	50	100	5
Cooling fluid	19	15^{+5}_{0}	50	25	1

8- Gauges

See Figure 5, Table 7 and 8 for details



Key

1 Recommended length 25 – max. diameter 2 times A
2 R_a 0,2max
3 Radius
4 Marking
5 All dimensions are in millimeters

Table 7 – Type 1 contact

Application	Gauge	A	B (max. flat)	C
Center	max.	0.394/0.399	0.10	Not applicable
	min.	0.363/0.368	0.10	Not applicable
Outer	max.	5,558/5.563	0.80	see note 1
	min.	5.512/5.517	0.80	see note 1

Table 8 – Type 2 contact

Application	Gauge	A	B (max. flat)	C
Center	max.	0,394/0,3954	0.10	Not applicable
	min.	0,3675/0,368	0.10	Not applicable
Outer	max.	5,555/5,60	0.80	see note 1
	min.	5,510/5,515	0.80	see note 1

Note 1: Provisions for a clearance hole shall be provided for outer contact

9- Technical specifications of reference.

See EN 3155-001.