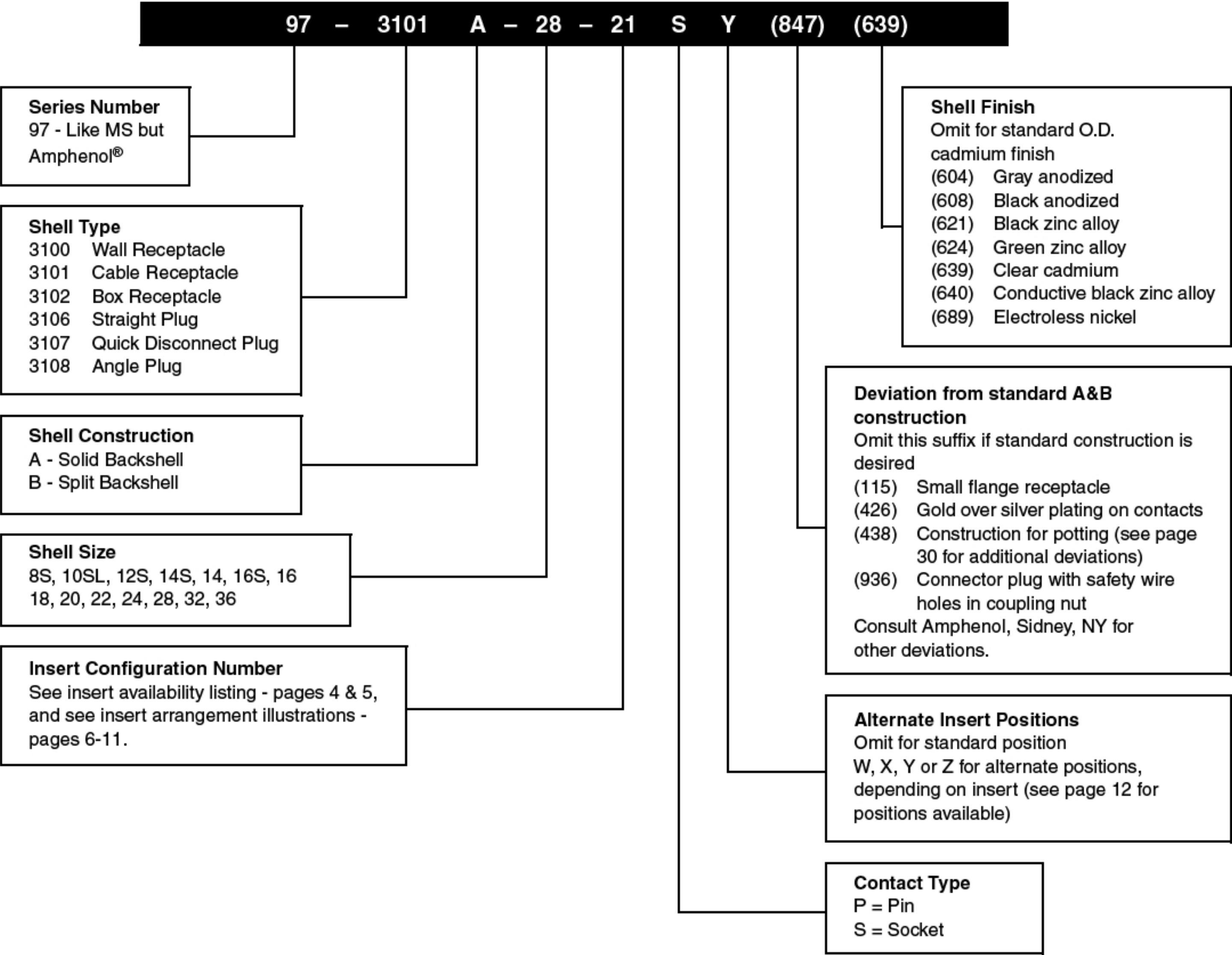


# 97 series solder type

## how to order

Example of part number for solder type connectors is given below.



Note: Accessories for 97 Series Connectors should be ordered with matching connector plating. See accessory pages 33-39.

# Amphenol® 97 Series Connectors with solder contacts



MS3100A



MS3107A



MS3101A



MS3107B



MS3102A



MS3108A



MS3106A



MS3108B



MS3106B

## DESIGN CHARACTERISTICS

- Medium to heavy weight cylindrical
- Durable, field-proven design
- Single key/keyway polarization
- Threaded coupling, hard dielectric inserts
- Non-rotating contacts
- Operating temperatures from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Cost effective
- Intermateable and intermountable with existing 97 Series and MIL-5015 connectors
- Underwriters Laboratories approved recognition File E115497
- Canadian Standards Association Certification File LR69183

## CUSTOMER OPTIONS

- Solid or split shell construction
- Six shell styles
- 128 contact arrangements, from 1 to 52 circuits
- Alternate insert positioning
- High temperature and potting constructions
- Special plating finishes including black and green zinc alloy
- Optional gold plating on MS contacts
- Thermocouple arrangements available

Connector components are fabricated from high grade aluminum alloy, with a conductive cadmium plate finish and an olive drab chromate after-treatment. Some cable clamps are a zinc alloy with an olive drab/green chromate finish. See how to order page 19 for other finish variations.

Contacts are silver plated with pre-tinned solder cups. Optional gold over silver plating is also available. Inserts for solder style contacts are diallyl-phthalate.

Users should be aware that classes "A" and "B" of MIL-5015 have been cancelled, and these products are no longer qualified.

# 97 series solder type insert availability

| Insert Number | Total Contacts | Mechanical Spacing |      | Service Rating | Contact Size |   |   |                 |                 |
|---------------|----------------|--------------------|------|----------------|--------------|---|---|-----------------|-----------------|
|               |                | Inches             | mm   |                | 0            | 4 | 8 | 12              | 16              |
| 8S-1+         | 1              | 1/16               | 1.57 | INST.          |              |   |   |                 | 1               |
| 10SL-3        | 3              | 1/16               | 1.57 | A              |              |   |   |                 | 3               |
| 10SL-4        | 2              | 1/16               | 1.57 | A              |              |   |   |                 | 2               |
| 12SL-844+*    | 4              | 1/16               | 1.57 | A              |              |   |   |                 | 4               |
| 12S-3         | 2              | 1/16               | 1.57 | A              |              |   |   |                 | 2               |
| 12-5+         | 1              | 1/8                | 3.18 | D              |              |   |   | 1               |                 |
| 12S-6+*       | 2              | 1/16               | 1.57 |                |              |   |   |                 | 2 Thermo-couple |
| 14S-1†        | 3              | 1/16               | 1.57 | A              |              |   |   |                 | 3               |
| 14S-2         | 4              |                    |      | INST.          |              |   |   |                 | 4               |
| 14S-4+†       | 1              | 1/8                | 3.18 | D              |              |   |   |                 | 1               |
| 14S-5         | 5              |                    |      | INST.          |              |   |   |                 | 5               |
| 14S-6         | 6              |                    |      | INST.          |              |   |   |                 | 6               |
| 14S-7         | 3              | 1/16               | 1.57 | A              |              |   |   |                 | 3               |
| 14S-9†        | 2              | 1/16               | 1.57 | A              |              |   |   |                 | 2               |
| 16S-1         | 7              | 1/16               | 1.57 | A              |              |   |   |                 | 7               |
| 16S-4+        | 2              | 1/8                | 3.18 | D              |              |   |   |                 | 2               |
| 16S-5         | 3              | 1/16               | 1.57 | A              |              |   |   |                 | 3               |
| 16S-6+†       | 3              | 1/16               | 1.57 | A              |              |   |   |                 | 3               |
| 16-7          | 3              | 1/16               | 1.57 | A              |              |   | 1 |                 | 2               |
| 16S-8         | 5              | 1/16               | 1.57 | A              |              |   |   |                 | 5               |
| 16-9          | 4              | 1/16               | 1.57 | A              |              |   |   | 2               | 2               |
| 16-10         | 3              | 1/16               | 1.57 | A              |              |   |   | 3               |                 |
| 16-11+†       | 2              | 1/16               | 1.57 | A              |              |   |   | 2               |                 |
| 16-12         | 1              | 1/16               | 1.57 | A              |              | 1 |   |                 |                 |
| 16-13         | 2              | 1/16               | 1.57 | A              |              |   |   | 2 Thermo-couple |                 |
| 18-1          | 10             | 1/16               | 1.57 | A              |              |   |   |                 | 4               |
|               |                |                    |      | INST.          |              |   |   |                 | 6               |
| 18-3†         | 2              | 1/8                | 3.18 | D              |              |   |   | 2               |                 |
| 18-4          | 4              | 1/8                | 3.18 | D              |              |   |   |                 | 4               |
| 18-5+         | 3              | 1/8                | 3.18 | D              |              |   |   | 2               | 1               |
| 18-8          | 8              | 1/16               | 1.57 | A              |              |   |   | 1               | 7               |
| 18-9+         | 7              |                    |      | INST.          |              |   |   | 2               | 5               |
| 18-10†        | 4              | 1/16               | 1.57 | A              |              |   |   | 4               |                 |
| 18-11         | 5              | 1/16               | 1.57 | A              |              |   |   | 5               |                 |
| 18-12†        | 6              | 1.16               | 1.57 | A              |              |   |   |                 | 6               |
| 18-13         | 4              | 1/16               | 1.57 | A              |              |   | 1 | 3               |                 |
| 18-16         | 1              | 5/16               | 7.92 | C              |              |   |   | 1               |                 |
| 18-19†        | 10             | 1/16               | 1.57 | A              |              |   |   |                 | 10              |
| 18-20         | 5              | 1/16               | 1.57 | A              |              |   |   |                 | 5               |
| 18-22†        | 3              | 1/8                | 3.18 | D              |              |   |   |                 | 3               |
| 18-29+†       | 5              | 1/16               | 1.57 | A              |              |   |   |                 | 5               |
| 18-420*       | 1              |                    |      |                |              |   |   | 1 Hi-Voltage**  |                 |
| 20-3†         | 3              | 1/8                | 3.18 | D              |              |   |   | 3               |                 |

| Insert Number | Total Contacts | Mechanical Spacing |      | Service Rating | Contact Size |   |   |    |    |
|---------------|----------------|--------------------|------|----------------|--------------|---|---|----|----|
|               |                | Inches             | mm   |                | 0            | 4 | 8 | 12 | 16 |
| 20-4          | 4              | 1/8                | 3.18 | D              |              |   |   | 4  |    |
| 20-6†         | 3              | 1/8                | 3.18 | D              |              |   |   |    | 3  |
| 20-7          | 8              | 1/8                | 3.18 | D              |              |   |   |    | 4  |
|               |                | 1/16               | 1.57 | A              |              |   |   |    | 4  |
| 20-8          | 6              |                    |      | INST.          |              |   | 2 |    | 4  |
| 20-11†        | 13             |                    |      | INST.          |              |   |   |    | 13 |
| 20-14         | 5              | 1/16               | 1.57 | A              |              |   | 2 | 3  |    |
| 20-15         | 7              | 1/16               | 1.57 | A              |              |   |   | 7  |    |
| 20-16         | 9              | 1/16               | 1.57 | A              |              |   |   | 2  | 7  |
| 20-17         | 6              | 1/16               | 1.57 | A              |              |   |   | 5  | 1  |
| 20-18         | 9              | 1/16               | 1.57 | A              |              |   |   | 3  | 6  |
| 20-19†        | 3              | 1/16               | 1.57 | A              |              |   | 3 |    |    |
| 20-21         | 9              | 1/16               | 1.57 | A              |              |   |   | 1  | 8  |
| 20-23         | 2              | 1/16               | 1.57 | A              |              |   | 2 |    |    |
| 20-24         | 4              | 1/16               | 1.57 | A              |              |   | 2 |    | 2  |
| 20-27         | 14             | 1/16               | 1.57 | A              |              |   |   |    | 14 |
| 20-29         | 17             | 1/16               | 1.57 | A              |              |   |   |    | 17 |
| 20-33         | 11             | 1/16               | 1.57 | A              |              |   |   |    | 11 |
| 22-1†         | 2              | 1/8                | 3.18 | D              |              |   | 2 |    |    |
| 22-2          | 3              | 1/8                | 3.18 | D              |              |   | 3 |    |    |
| 22-4†         | 4              | 1/16               | 1.57 | A              |              |   | 2 | 2  |    |
| 22-5          | 6              | 1/8                | 3.18 | D              |              |   |   | 2  | 4  |
| 22-8†         | 2              | 3/16               | 4.75 | E              |              |   |   | 2  |    |
| 22-9          | 3              | 3/16               | 4.75 | E              |              |   |   | 3  |    |
| 22-10         | 4              | 3/16               | 4.75 | E              |              |   |   |    | 4  |
| 22-11         | 2              | 1/4                | 6.35 | B              |              |   |   |    | 2  |
| 22-12         | 5              | 1/8                | 3.18 | D              |              |   | 2 |    | 3  |
| 22-13†        | 5              | 1/8                | 3.18 | D              |              |   |   |    | 1  |
|               |                | 1/16               | 1.57 | A              |              |   |   | 4  |    |
| 22-14         | 19             | 1/16               | 1.57 | A              |              |   |   |    | 19 |
| 22-15         | 6              | 3/16               | 4.75 | E              |              |   |   |    | 1  |
|               |                | 1/16               | 1.57 | A              |              |   |   | 5  |    |
| 22-16†        | 9              | 1/16               | 1.57 | A              |              |   |   | 3  | 6  |
| 22-18         | 8              | 1/8                | 3.18 | D              |              |   |   |    | 5  |
|               |                | 1/16               | 1.57 | A              |              |   |   |    | 3  |
| 22-19         | 14             | 1/16               | 1.57 | A              |              |   |   |    | 14 |
| 22-20†        | 9              | 1/16               | 1.57 | A              |              |   |   |    | 9  |
| 22-22         | 4              | 1/16               | 1.57 | A              |              |   | 4 |    |    |
| 22-23         | 8              | 1/8                | 3.18 | D              |              |   |   | 1  |    |
|               |                | 1/16               | 1.57 | A              |              |   |   | 7  |    |

Not all insert arrangements are currently available for environmental individual wire seal. Consult Amphenol, Sidney, NY for availability.

† Inactive for new military design, but available for replacement or for non-military purposes.

\* "MS" number not assigned. Use "97" prefix in place of "MS" in completing catalog number. See how to order, page 19.

\*\* Hi-Voltage = 17KVAC/24KVDC

♦ Molded-in pin (MIP) insert requires (910) deviation. See how to order, pg. 19.

# 97 series solder type insert availability, cont.

| Insert Number | Total Contacts | Mechanical Spacing |      | Service Rating | Contact Size |   |   |    |    |
|---------------|----------------|--------------------|------|----------------|--------------|---|---|----|----|
|               |                | Inches             | mm   |                | 0            | 4 | 8 | 12 | 16 |
| 22-26*        | 7              | 1/8                | 3.18 |                |              |   |   | 2  | 5  |
| 22-27         | 9              | 1/8                | 3.18 | D              |              |   | 1 |    |    |
|               |                | 1/16               | 1.57 | A              |              |   |   |    | 8  |
| 22-28†        | 7              | 1/16               | 1.57 | A              |              |   |   | 7  |    |
| 22-34         | 5              | 1/8                | 3.18 | D              |              |   |   | 3  | 2  |
| 24-2          | 7              | 1/8                | 3.18 | D              |              |   |   | 7  |    |
| 24-5†         | 16             | 1/16               | 1.57 | A              |              |   |   |    | 16 |
| 24-6          | 8              | 1/8                | 3.18 | D              |              |   |   | 3  |    |
|               |                | 1/16               | 1.57 | A              |              |   |   | 5  |    |
| 24-7          | 16             | 1/16               | 1.57 | A              |              |   |   | 2  | 14 |
| 24-9†         | 2              | 1/16               | 1.57 | A              |              | 2 |   |    |    |
| 24-10         | 7              | 1/16               | 1.57 | A              |              |   | 7 |    |    |
| 24-11         | 9              | 1/16               | 1.57 | A              |              |   | 3 | 6  |    |
| 24-12         | 5              | 1/16               | 1.57 | A              |              | 2 |   | 3  |    |
| 24-16         | 7              | 1/8                | 3.18 | D              |              |   | 1 |    | 3  |
|               |                | 1/16               | 1.57 | A              |              |   |   | 3  |    |
| 24-19†        | 12             | 1/16               | 1.57 |                |              |   |   |    | 12 |
| 24-20*        | 11             | 1/8                | 3.18 | D              |              |   |   | 2  | 9  |
| 24-21         | 10             | 1/8                | 3.18 | D              |              |   | 1 |    | 9  |
| 24-22*        | 4              | 1/8                | 3.18 | D              |              |   | 4 |    |    |
| 24-27         | 7              | 3/16               | 4.75 | E              |              |   |   |    | 7  |
| 24-28         | 24             | 1/16               | 1.57 | INST.          |              |   |   |    | 24 |
| 28-1          | 9              | 1/8                | 3.18 | D              |              |   | 1 | 2  |    |
|               |                | 1/16               | 1.57 | A              |              |   | 2 | 4  |    |
| 28-2          | 14             | 1/8                | 3.18 | D              |              |   |   | 2  | 12 |
| 28-3          | 3              | 3/16               | 4.75 | E              |              |   | 3 |    |    |
| 28-6†         | 3              | 1/8                | 3.18 | D              |              | 3 |   |    |    |
| 28-8          | 12             | 1/16               | 1.57 | A              |              |   |   |    | 9  |
|               |                | 1/8                | 3.18 | D              |              |   |   |    | 1  |
|               |                | 3/16               | 4.75 | E              |              |   |   | 2  |    |
| 28-9          | 12             | 1/8                | 3.18 | D              |              |   |   | 6  | 6  |
| 28-10         | 7              | 1/8                | 3.18 | D              |              |   |   | 1  |    |
|               |                | 1/16               | 1.57 | A              |              | 2 | 2 | 2  |    |
| 28-11         | 22             | 1/16               | 1.57 | A              |              |   |   | 4  | 18 |
| 28-12         | 26             | 1/16               | 1.57 | A              |              |   |   |    | 26 |
| 28-15†        | 35             | 1/16               | 1.57 | A              |              |   |   |    | 35 |
| 28-16†        | 20             | 1/16               | 1.57 | A              |              |   |   |    | 20 |
| 28-17         | 15             | 1/4                | 6.35 | B              |              |   |   |    | 1  |
|               |                | 1/8                | 3.18 | D              |              |   |   |    | 3  |
|               |                | 1/16               | 1.57 | A              |              |   |   |    | 11 |
| 28-18         | 12             | 5/16               | 7.92 | C              |              |   |   |    | 1  |
|               |                | 1/8                | 3.18 | D              |              |   |   |    | 5  |
|               |                | 1/16               | 1.57 | A              |              |   |   |    | 2  |
|               |                |                    |      | INST.          |              |   |   |    | 4  |
| 28-19         | 10             | 1/4                | 6.35 | B              |              |   |   |    | 2  |
|               |                | 1/8                | 3.18 | D              |              |   |   |    | 2  |
|               |                | 1/16               | 1.57 | A              |              |   |   | 4  | 2  |

| Insert Number | Total Contacts | Mechanical Spacing |      | Service Rating | Contact Size |   |   |    |    |
|---------------|----------------|--------------------|------|----------------|--------------|---|---|----|----|
|               |                | Inches             | mm   |                | 0            | 4 | 8 | 12 | 16 |
| 28-20         | 14             | 1/16               | 1.57 | A              |              |   |   | 10 | 4  |
| 28-21         | 37             | 1/16               | 1.57 | A              |              |   |   |    | 37 |
| 32-5†         | 2              | 1/8                | 3.18 | D              | 2            |   |   |    |    |
| 32-6          | 23             | 1/16               | 1.57 | A              |              | 2 | 3 | 2  | 16 |
| 32-7          | 35             | 1/16               | 1.57 | A              |              |   |   | 7  | 24 |
|               |                |                    |      | INST.          |              |   |   |    | 4  |
| 32-8†         | 30             | 1/16               | 1.57 | A              |              |   |   | 6  | 24 |
| 32-13         | 23             | 1/8                | 3.18 | D              |              |   |   | 5  | 18 |
| 32-17         | 4              | 1/8                | 3.18 | D              |              | 4 |   |    |    |
| 32-414        | 52             | 1/16               | 1.57 | A              |              |   |   |    | 52 |
| 36-1†         | 22             | 1/8                | 3.18 | D              |              |   |   | 4  | 18 |
| 36-5          | 4              | 1/16               | 1.57 | A              | 4            |   |   |    |    |
| 36-6          | 6              | 1/16               | 1.57 | A              | 2            | 4 |   |    |    |
| 36-7          | 47             | 1/16               | 1.57 | A              |              |   |   | 7  | 40 |
| 36-8          | 47             | 1/16               | 1.57 | A              |              |   |   | 1  | 46 |
| 36-9          | 31             | 1/16               | 1.57 | A              |              | 1 | 2 | 14 | 14 |
| 36-10         | 48             | 1/16               | 1.57 | A              |              |   |   |    | 48 |
| 36-15         | 35             | 1/16               | 1.57 | A              |              |   |   |    | 34 |
|               |                | 1/8                | 3.18 | D              |              |   |   |    | 1  |
| 36-403*       | 52             | 1/16               | 1.57 | A              |              |   |   |    | 52 |

Not all insert arrangements are currently available for environmental individual wire seal. Consult Amphenol, Sidney, NY for availability.

† Inactive for new military design, but available for replacement or for non-military purposes.

\* "MS" number not assigned. Use "97" prefix in place of "MS" in completing catalog number. See how to order, page 19.

◆ Molded-in pin (MIP) insert requires (910) deviation. See how to order, pg. 19.

# 97 series solder type insert arrangements

Front view of pin insert or rear of socket insert illustrated.

Items highlighted are most popular and most readily available.

## 1 Contact

|                    |       |      |        |       |       |                               |
|--------------------|-------|------|--------|-------|-------|-------------------------------|
|                    |       |      |        |       |       |                               |
| Insert Arrangement | 8S-1  | 12-5 | 14S-4† | 16-12 | 18-16 | 18-420*                       |
| Contacts           | 1#16  | 1#12 | 1#16   | 1#4   | 1#12  | 1#12                          |
| Service Rating     | INST. | D    | D      | A     | C     | High Voltage<br>17KVAC/24KVDC |

## 2 Contacts

|                    |        |       |              |        |       |        |       |
|--------------------|--------|-------|--------------|--------|-------|--------|-------|
|                    |        |       |              |        |       |        |       |
| Insert Arrangement | 10SL-4 | 12S-3 | 12S-6*       | 14S-9† | 16S-4 | 16-11† | 16-13 |
| Contacts           | 2#16   | 2#16  | 2#16         | 2#16   | 2#16  | 2#12   | 2#12  |
| Service Rating     | A      | A     | Thermocouple | A      | D     | A      | A     |

|                    |       |        |       |       |       |       |       |
|--------------------|-------|--------|-------|-------|-------|-------|-------|
|                    |       |        |       |       |       |       |       |
| Insert Arrangement | 18-3† | 20-23† | 22-1† | 22-8† | 22-11 | 24-9† | 32-5† |
| Contacts           | 2#12  | 2#8    | 2#8   | 2#12  | 2#16  | 2#4   | 2#0   |
| Service Rating     | D     | A      | D     | E     | B     | A     | D     |

## 3 Contacts

|                    |        |        |       |        |        |           |       |            |
|--------------------|--------|--------|-------|--------|--------|-----------|-------|------------|
|                    |        |        |       |        |        |           |       |            |
| Insert Arrangement | 10SL-3 | 14S-1† | 14S-7 | 16S-5† | 16S-6† | 16-7      | 16-10 | 18-5       |
| Contacts           | 3#16   | 3#16   | 3#16  | 3#16   | 3#16   | 1#8, 2#16 | 3#12  | 2#12, 1#16 |
| Service Rating     | A      | A      | A     | A      | A      | A         | A     | D          |

|                    |       |       |        |      |      |      |       |
|--------------------|-------|-------|--------|------|------|------|-------|
|                    |       |       |        |      |      |      |       |
| Insert Arrangement | 20-3† | 20-6† | 20-19† | 22-2 | 22-9 | 28-3 | 28-6† |
| Contacts           | 3#12  | 3#16  | 3#8    | 3#8  | 3#12 | 3#8  | 3#4   |
| Service Rating     | D     | D     | A      | D    | E    | E    | D     |

# 97 series solder type

## insert arrangements, cont.

Front view of pin insert or rear of socket insert illustrated.

Items highlighted are most popular and most readily available.

### 4 Contacts

|                    |               |        |            |      |        |           |      |
|--------------------|---------------|--------|------------|------|--------|-----------|------|
|                    |               |        |            |      |        |           |      |
| Insert Arrangement | 12SL-844*     | 14S-2† | 16-9       | 18-4 | 18-10† | 18-13     | 20-4 |
| Contacts           | 4#16          | 4#16   | 2#12, 2#16 | 4#16 | 4#12   | 3#12, 1#8 | 4#12 |
| Service Rating     | 1/16" spacing | INST.  | A          | D    | A      | A         | D    |

|                    |           |           |       |       |       |       |      |
|--------------------|-----------|-----------|-------|-------|-------|-------|------|
|                    |           |           |       |       |       |       |      |
| Insert Arrangement | 20-24     | 22-4†     | 22-10 | 22-22 | 24-22 | 32-17 | 36-5 |
| Contacts           | 2#8, 2#16 | 2#8, 2#12 | 4#16  | 4#8   | 4#8   | 4#4   | 4#0  |
| Service Rating     | A         | A         | E     | A     | D     | D     | A    |

### 5 Contacts

|                    |       |       |       |        |        |           |
|--------------------|-------|-------|-------|--------|--------|-----------|
|                    |       |       |       |        |        |           |
| Insert Arrangement | 14S-5 | 16S-8 | 18-11 | 18-20† | 18-29† | 20-14     |
| Contacts           | 5#16  | 5#16  | 5#12  | 5#16   | 5#16   | 3#12, 2#8 |
| Service Rating     | INST. | A     | A     | A      | A      | A         |

|                    |           |                       |            |           |
|--------------------|-----------|-----------------------|------------|-----------|
|                    |           |                       |            |           |
| Insert Arrangement | 22-12     | 22-13†                | 22-34†     | 24-12     |
| Contacts           | 2#8, 3#16 | 1#16, 4#12            | 3#12, 2#16 | 2#4, 3#12 |
| Service Rating     | D         | E = D; A, B, C, D = A | D          | A         |

### MIL-SPEC SERVICE RATING

|                                                      |          | INST. | A    | D    | E    | B    | C     |
|------------------------------------------------------|----------|-------|------|------|------|------|-------|
| Limiting Operating                                   | DC       | 250   | 700  | 1250 | 1750 | 2450 | 4200  |
| Voltages at Sea Level                                | AC (rms) | 200   | 500  | 900  | 1250 | 1750 | 3000  |
| See notes 1 and 2 under TEST CURRENT.                |          |       |      |      |      |      |       |
| INST. service normally for low voltage and currents. |          |       |      |      |      |      |       |
| Effective Creepage (nominal)                         | Inch     | 1/16  | 1/8  | 3/16 | 1/4  | 5/16 | 1     |
|                                                      | mm       | 1.57  | 3.18 | 4.75 | 6.35 | 7.92 | 25.40 |
| Mechanical Spacing (nominal)                         | Inch     |       | 1/16 | 1/8  | 3/16 | 1/4  | 5/16  |
|                                                      | mm       |       | 1.57 | 3.18 | 4.75 | 6.35 | 7.92  |

† Inactive for new military design, but available for replacement or for non-military purposes.  
\* "MS" number not assigned. Use "97" prefix in place of "MS" in completing catalog number. See how to order, page 19.

### TEST CURRENT

|                                                                                                            |    |    |    |    |     |
|------------------------------------------------------------------------------------------------------------|----|----|----|----|-----|
| Contact Size                                                                                               | 16 | 12 | 8  | 4  | 0   |
| Amperes                                                                                                    | 13 | 23 | 46 | 80 | 150 |
| NOTE 1: Transients were not considered in calculating these values.                                        |    |    |    |    |     |
| NOTE 2: Limiting operating voltages at 50,000 feet altitude are approximately 25% of the sea level values. |    |    |    |    |     |

### CONTACT LEGEND

|      |    |   |   |            |    |    |    |
|------|----|---|---|------------|----|----|----|
|      |    |   |   |            |    |    |    |
| 16   | 12 | 8 | 4 | 0          | 16 | 12 | 16 |
| IRON |    |   |   | CONSTANTAN |    |    |    |

# 97 series solder type insert arrangements, cont.

Front view of pin insert or rear of socket insert illustrated.

Items highlighted are most popular and most readily available.

## 6 Contacts

|                    |       |        |           |            |            |                          |          |
|--------------------|-------|--------|-----------|------------|------------|--------------------------|----------|
|                    |       |        |           |            |            |                          |          |
| Insert Arrangement | 14S-6 | 18-12† | 20-8      | 20-17      | 22-5       | 22-15                    | 36-6     |
| Contacts           | 6#16  | 6#16   | 4#16, 2#8 | 5#12, 1#16 | 2#12, 4#16 | 5#12, 1#16               | 2#0, 4#4 |
| Service Rating     | INST. | A      | INST.     | A          | D          | D = E; A, B, C, E, F = A | A        |

## 7 Contacts

|                    |       |            |       |              |        |
|--------------------|-------|------------|-------|--------------|--------|
|                    |       |            |       |              |        |
| Insert Arrangement | 16S-1 | 18-9       | 20-15 | 22-26*       | 22-28† |
| Contacts           | 7#16  | 5#16, 2#12 | 7#12  | 2#12, 5#16   | 7#12   |
| Service Rating     | A     | INST.      | A     | 1/8" spacing | A      |

|                    |      |       |                                |       |                       |
|--------------------|------|-------|--------------------------------|-------|-----------------------|
|                    |      |       |                                |       |                       |
| Insert Arrangement | 24-2 | 24-10 | 24-16                          | 24-27 | 28-10                 |
| Contacts           | 7#12 | 7#8   | 3#16, 1#8, 3#12                | 7#16  | 3#12, 2#8, 2#4        |
| Service Rating     | D    | A     | A, B, F, G = D;<br>C, D, E = A | E     | G = D; all others = A |

## 8 Contacts

|                    |            |                                   |                                      |                          |                                |
|--------------------|------------|-----------------------------------|--------------------------------------|--------------------------|--------------------------------|
|                    |            |                                   |                                      |                          |                                |
| Insert Arrangement | 18-8       | 20-7                              | 22-18                                | 22-23                    | 24-6                           |
| Contacts           | 1#12, 7#16 | 8#16                              | 8#16                                 | 8#12                     | 8#12                           |
| Service Rating     | A          | A, B, H, G = D;<br>C, D, E, F = A | A, B, H, F, G = D;<br>all others = A | H = D;<br>all others = A | A, G, H = D;<br>all others = A |

# 97 series solder type

## insert arrangements, cont.

Front view of pin insert or rear of socket insert illustrated.

Items highlighted are most popular and most readily available.

### 9 Contacts

|                    |            |            |            |            |        |
|--------------------|------------|------------|------------|------------|--------|
|                    |            |            |            |            |        |
| Insert Arrangement | 20-16      | 20-18      | 20-21      | 22-16†     | 22-20† |
| Contacts           | 7#16, 2#12 | 3#12, 6#16 | 1#12, 8#16 | 3#12, 6#16 | 9#16   |
| Service Rating     | A          | A          | A          | A          | A      |

|                    |                       |           |                             |
|--------------------|-----------------------|-----------|-----------------------------|
|                    |                       |           |                             |
| Insert Arrangement | 22-27                 | 24-11     | 28-1                        |
| Contacts           | 1#8, 8#16             | 3#8, 6#12 | 3#8, 6#12                   |
| Service Rating     | J = D; all others = A | A         | A, J, E = D; all others = A |

### 10 Contacts

|                    |                                       |       |           |                                       |
|--------------------|---------------------------------------|-------|-----------|---------------------------------------|
|                    |                                       |       |           |                                       |
| Insert Arrangement | 18-1                                  | 18-19 | 24-21     | 28-19                                 |
| Contacts           | 10#16                                 | 10#16 | 1#8, 9#16 | 4#12, 6#16                            |
| Service Rating     | B, C, F, G = A;<br>all others = INST. | A     | D         | H, M = B; A, B = D;<br>all others = A |

### 11 Contacts

|       |            |
|-------|------------|
|       |            |
| 20-33 | 24-20      |
| 11#16 | 2#12, 9#16 |
| A     | D          |

### 12 Contacts

|                    |               |                                    |            |                                                       |
|--------------------|---------------|------------------------------------|------------|-------------------------------------------------------|
|                    |               |                                    |            |                                                       |
| Insert Arrangement | 24-19†        | 28-8                               | 28-9       | 28-18                                                 |
| Contacts           | 12#16         | 2#12, 10#16                        | 6#12, 6#16 | 12#16                                                 |
| Service Rating     | 1/16" spacing | L, M = E; B = D;<br>all others = A | D          | M = C; A, B = A<br>C, D, E, F = INST.; all others = D |

### 13 Contacts

|        |
|--------|
|        |
| 20-11† |
| 13#16  |
| INST.  |

† Inactive for new military design, but available for replacement or for non-military purposes.  
 \* "MS" number not assigned. Use "97" prefix in place of "MS" in completing catalog number. See how to order, page 19.  
 See Service Rating and Test Current information on page 7.

CONTACT LEGEND

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⊕

16

12

8

4

0

# 97 series solder type insert arrangements, cont.

Front view of pin insert or rear of socket insert illustrated.

Items highlighted are most popular and most readily available.

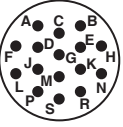
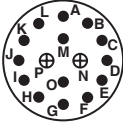
## 14 Contacts

|                    |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
|--------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                    |  |  |  |  |
| Insert Arrangement | 20-27                                                                             | 22-19                                                                             | 28-2                                                                              | 28-20                                                                              |
| Contacts           | 14#16                                                                             | 14#16                                                                             | 2#12, 12#16                                                                       | 10#12, 4#16                                                                        |
| Service Rating     | A                                                                                 | A                                                                                 | D                                                                                 | A                                                                                  |

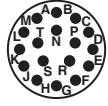
## 15 Contacts

|                                                                                     |
|-------------------------------------------------------------------------------------|
|  |
| 28-17                                                                               |
| 15#16                                                                               |
| R = B; M, N, P = D;<br>all others = A                                               |

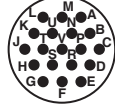
## 16 Contacts

|                    |                                                                                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                    |  |  |
| Insert Arrangement | 24-5†                                                                              | 24-7                                                                               |
| Contacts           | 16#16                                                                              | 2#12, 14#16                                                                        |
| Service Rating     | A                                                                                  | A                                                                                  |

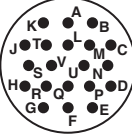
## 17 Contacts

|                                                                                     |
|-------------------------------------------------------------------------------------|
|  |
| 20-29                                                                               |
| 17#16                                                                               |
| A                                                                                   |

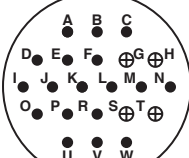
## 19 Contacts

|                                                                                      |
|--------------------------------------------------------------------------------------|
|  |
| 22-14                                                                                |
| 19#16                                                                                |
| A                                                                                    |

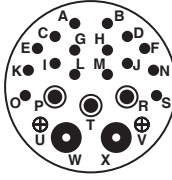
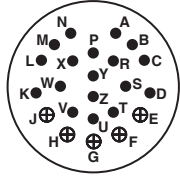
## 20 Contacts

|                                                                                     |
|-------------------------------------------------------------------------------------|
|  |
| 28-16†                                                                              |
| 20#16                                                                               |
| A                                                                                   |

## 22 Contacts

|                                                                                     |                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |
| 28-11                                                                               | 36-1†                                                                               |
| 4#12, 18#16                                                                         | 4#12, 18#16                                                                         |
| A                                                                                   | D                                                                                   |

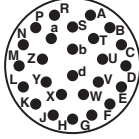
## 23 Contacts

|                                                                                       |                                                                                       |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |
| 32-6                                                                                  | 32-13                                                                                 |
| 2#4, 3#8, 2#12, 16#16                                                                 | 5#12, 18#16                                                                           |
| A                                                                                     | D                                                                                     |

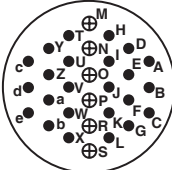
## 24 Contacts

|                                                                                     |
|-------------------------------------------------------------------------------------|
|  |
| 24-28                                                                               |
| 24#16                                                                               |
| INST.                                                                               |

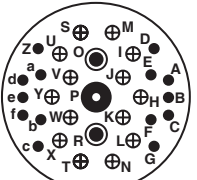
## 26 Contacts

|                                                                                     |
|-------------------------------------------------------------------------------------|
|  |
| 28-12                                                                               |
| 26#16                                                                               |
| A                                                                                   |

## 30 Contacts

|                                                                                      |
|--------------------------------------------------------------------------------------|
|  |
| 32-8†                                                                                |
| 6#12, 24#16                                                                          |
| A                                                                                    |

## 31 Contacts

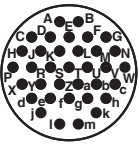
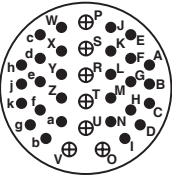
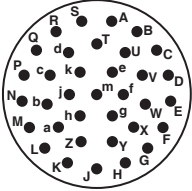
|                                                                                       |
|---------------------------------------------------------------------------------------|
|  |
| 36-9                                                                                  |
| 1#4, 2#8, 14#12, 14#16                                                                |
| A                                                                                     |

# 97 series solder type insert arrangements, cont.

Front view of pin insert or rear of socket insert illustrated.

Items highlighted are most popular and most readily available.

## 35 Contacts

Insert Arrangement

Contacts

Service Rating

28-15†

35#16

A

32-7

7#12, 28#16

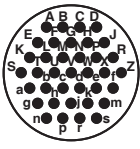
A, B, h, j = INST.;  
all others = A

36-15

35#16

m = D; all others = A

## 37 Contacts



Insert Arrangement

Contacts

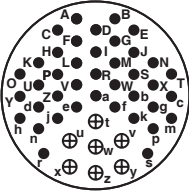
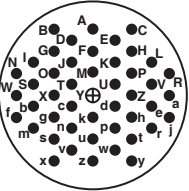
Service Rating

28-21

37#16

A

## 47 Contacts

Insert Arrangement

Contacts

Service Rating

36-7

7#12, 40#16

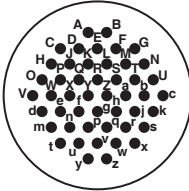
A

36-8

1#12, 46#16

A

## 48 Contacts



Insert Arrangement

Contacts

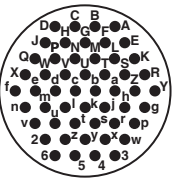
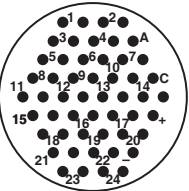
Service Rating

36-10

48#16

A

## 52 Contacts

Insert Arrangement

Contacts

Service Rating

32-414\*

52#16

A

36-403\*

52#16

A

† Inactive for new military design, but available for replacement or for non-military purposes.  
 \* "MS" number not assigned. Use "97" prefix in place of "MS" in completing catalog number. See how to order, page 19.  
 See Service Rating and Test Current information on page 7.

CONTACT LEGEND

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16

12

8

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# 97 series solder type

## alternate insert positioning



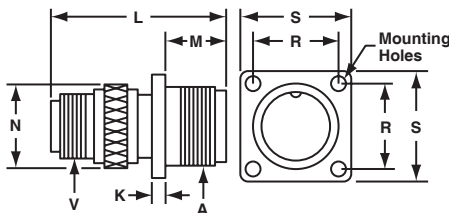
| Insert Arrangement | Degrees |     |     |     |
|--------------------|---------|-----|-----|-----|
|                    | W       | X   | Y   | Z   |
| 12S-3              | 70      | 145 | 215 | 290 |
| 14S-2              | —       | 120 | 240 | —   |
| 14S-5              | —       | 110 | —   | —   |
| 14S-7              | 90      | 180 | 270 | —   |
| 14S-9              | 70      | 145 | 215 | 290 |
| 16S-1              | 80      | —   | —   | 280 |
| 16S-4              | 35      | 110 | 250 | 325 |
| 16S-5              | 70      | 145 | 215 | 290 |
| 16S-6              | 90      | 180 | 270 | —   |
| 16-7               | 80      | 110 | 250 | 280 |
| 16S-8              | —       | 170 | 265 | —   |
| 16-9               | 35      | 110 | 250 | 325 |
| 16-10              | 90      | 180 | 270 | —   |
| 16-11              | 35      | 110 | 250 | 325 |
| 16-13              | 35      | 110 | 250 | 325 |
| 18-1               | 70      | 145 | 215 | 290 |
| 18-3               | 35      | 110 | 250 | 325 |
| 18-4               | 35      | 110 | 250 | 325 |
| 18-5               | 80      | 110 | 250 | 280 |
| 18-8               | 70      | —   | —   | 290 |
| 18-9               | 80      | 110 | 250 | 280 |
| 18-10              | —       | 120 | 240 | —   |
| 18-11              | —       | 170 | 265 | —   |
| 18-12              | 80      | —   | —   | 280 |
| 18-13              | 80      | 110 | 250 | 280 |
| 18-19              | —       | 120 | 240 | —   |
| 18-20              | 90      | 180 | 270 | —   |
| 18-22              | 70      | 145 | 215 | 290 |
| 18-29              | 90      | 180 | 270 | —   |
| 20-3               | 70      | 145 | 215 | 290 |
| 20-4               | 45      | 110 | 250 | —   |
| 20-6               | 70      | 145 | 215 | 290 |
| 20-7               | 80      | 110 | 250 | 280 |
| 20-8               | 80      | 110 | 250 | 280 |
| 20-14              | 80      | 110 | 250 | 280 |
| 20-15              | 80      | —   | —   | 280 |
| 20-16              | 80      | 110 | 250 | 280 |
| 20-17              | 90      | 180 | 270 | —   |
| 20-18              | 35      | 110 | 250 | 325 |
| 20-19              | 90      | 180 | 270 | —   |
| 20-21              | 35      | 110 | 250 | 325 |
| 20-23              | 35      | 110 | 250 | 325 |
| 20-24              | 35      | 110 | 250 | 325 |
| 20-27              | 35      | 110 | 250 | 325 |
| 20-29              | 80      | —   | —   | 280 |

| Insert Arrangement | Degrees |      |      |      |
|--------------------|---------|------|------|------|
|                    | W       | X    | Y    | Z    |
| 22-1               | 35      | 110  | 250  | 325  |
| 22-2               | 70      | 145  | 215  | 290  |
| 22-4               | 35      | 110  | 250  | 325  |
| 22-5               | 35      | 110  | 250  | 325  |
| 22-8               | 35      | 110  | 250  | 325  |
| 22-9               | 70      | 145  | 215  | 290  |
| 22-10              | 35      | 110  | 250  | 325  |
| 22-11              | 35      | 110  | 250  | 325  |
| 22-12              | 80      | 110  | 250  | 280  |
| 22-13              | 35      | 110  | 250  | 325  |
| 22-14              | 80      | 110  | 250  | 280  |
| 22-15              | 80      | 110  | 250  | 280  |
| 22-16              | 80      | 110  | 250  | 280  |
| 22-18              | 80      | 110  | 250  | 280  |
| 22-19              | 80      | 110  | 250  | 280  |
| 22-20              | 35      | 110  | 250  | 325  |
| 22-22              | —       | 110  | 250  | —    |
| 22-23              | 35      | —    | 250  | —    |
| 22-27              | 80      | —    | 250  | 280  |
| 22-28              | 80      | —    | —    | 280  |
| 22-34              | 80      | 110  | 250  | 280  |
| 24-2               | 80      | —    | —    | 280  |
| 24-5               | 80      | 110  | 250  | 280  |
| 24-6               | 80      | 110  | 250  | 280  |
| 24-7               | 80      | 110  | 250  | 280  |
| 24-9               | 35      | 110  | 250  | 325  |
| 24-10              | 80      | —    | —    | 280  |
| 24-11              | 35      | 110  | 250  | 325  |
| 24-12              | 80      | 110  | 250  | 280  |
| 24-16              | 80      | 110  | 250  | 280  |
| 24-20              | 80      | 110  | 250  | 280  |
| 24-21              | 80      | 110  | 250  | 280  |
| 24-22              | 45      | 110  | 250  | —    |
| 24-27              | 80      | —    | —    | 280  |
| 24-28              | 80      | 110  | 250  | 280  |
| 28-1               | 80      | 110  | 250  | 280  |
| 28-2               | 35      | 110  | 250  | 325  |
| 28-3               | 70      | 145  | 215  | 290  |
| 28-6               | 70      | 145  | 215  | 290  |
| 28-8               | 80      | 110  | 250  | 280  |
| 28-9               | 80      | 110  | 250  | 280  |
| 28-10              | 80      | 110  | 250  | 280  |
| 28-11              | 80      | 110  | 250  | 280  |
| 28-12              | 90      | 180  | 270  | —    |
| 28-15              | 80      | 110  | 250  | 280  |
| 28-16              | 80      | 110  | 250  | 280  |
| 28-17              | 80      | 110  | 250  | 280  |
| 28-18              | 70      | 145  | 215  | 290  |
| 28-19              | 80      | 110  | 250  | 280  |
| 28-20              | 80      | 110  | 250  | 280  |
| 28-21              | 80      | 110  | 250  | 280  |
| 32-5               | 35      | 110  | 250  | 325  |
| 32-6               | 80      | 110  | 250  | 280  |
| 32-7               | 80      | 125  | 235  | 280  |
| 32-8               | 80      | 125  | 235  | 280  |
| 32-13              | 80      | 110  | 250  | 280  |
| 32-17              | 45      | 110  | 250  | —    |
| 32-414*            | 80*     | 110* | 250* | 280* |
| 36-1               | 80      | 110  | 250  | 280  |
| 36-5               | —       | 120  | 240  | —    |
| 36-6               | 35      | 110  | 250  | 325  |
| 36-7               | 80      | 110  | 250  | 280  |
| 36-8               | 80      | 110  | 250  | 280  |
| 36-9               | 80      | 125  | 235  | 280  |
| 36-10              | 80      | 125  | 235  | 280  |
| 36-15              | 60      | 125  | 245  | 305  |

# 97 series solder type receptacles

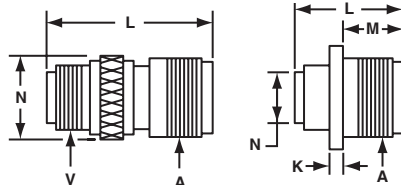
## MS3100A wall mount receptacle

Solid shell construction is strong and conserves space. Includes integral polarizing key in front. Back shell is threaded for standard MS/AN fittings.



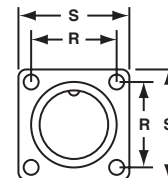
## MS3101A cable receptacle

Solid shell construction is strong and conserves space. Includes integral polarizing key in front shell. Machined back shell is threaded for standard MS/AN fittings. Can be unscrewed for inspection or soldering.

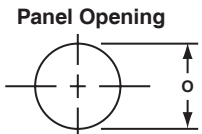


## MS3102A box receptacle

Solid shell designed for open wiring. Mounts directly on chassis, equipment or panel. Includes internal polarized key in front shell.



**Mounting Holes**  
 .173 (4.394) DIA.  
 FOR SIZE 32 AND 36  
 .147 (3.734) DIA.  
 FOR SIZES 24 AND 28  
 .120 (3.048) DIA.  
 FOR ALL OTHER SIZES



## MS3100A and MS3101A

| Connector Size | A Coupling Thread | K Ref. |      | L Max.  |       | M Ref. |       | N Ref. |       | O Ref. |       | R Ref.  |       | S Ref. |       | V Fitting Threads |
|----------------|-------------------|--------|------|---------|-------|--------|-------|--------|-------|--------|-------|---------|-------|--------|-------|-------------------|
|                |                   | Inch   | mm   | Inch    | mm    | Inch   | mm    | Inch   | mm    | Inch   | mm    | Inch    | mm    | Inch   | mm    |                   |
| 8S             | 1/2-28            | 5/64   | 1.98 | 1-1/4   | 31.75 | 9/16   | 14.27 | 17/32  | 13.49 | .562   | 14.27 | 19/32   | 15.06 | 7/8    | 22.23 | 1/2-28            |
| 10S            | 5/8-24            | 5/64   | 1.98 | 1-5/16  | 33.32 | 9/16   | 14.27 | 5/8    | 15.88 | .688   | 17.48 | 23/32   | 18.24 | 1      | 25.40 | 1/2-28            |
| 10SL           | 5/8-24            | 5/64   | 1.98 | 1-9/32  | 32.53 | 9/16   | 14.27 | 3/4    | 19.05 | .812   | 20.62 | 23/32   | 18.24 | 1      | 25.40 | 5/8-24            |
| 12S            | 3/4-20            | 5/64   | 1.98 | 1-15/32 | 37.29 | 9/16   | 14.27 | 25/32  | 19.84 | .812   | 20.62 | 13/16   | 20.62 | 1-3/32 | 27.76 | 5/8-24            |
| 12             | 3/4-20            | 5/64   | 1.98 | 1-27/32 | 46.81 | 3/4    | 19.05 | 25/32  | 19.84 | .812   | 20.62 | 13/16   | 20.62 | 1-3/32 | 27.76 | 5/8-24            |
| 14S            | 7/8-20            | 5/64   | 1.98 | 1-15/32 | 37.39 | 9/16   | 14.27 | 7/8    | 22.23 | .938   | 23.83 | 29/32   | 23.01 | 1-3/16 | 30.15 | 3/4-20            |
| 14             | 7/8-20            | 5/64   | 1.98 | 1-55/64 | 47.04 | 3/4    | 19.05 | 7/8    | 22.23 | .938   | 23.83 | 29/32   | 23.01 | 1-3/16 | 30.15 | 3/4-20            |
| 16S            | 1 -20             | 5/64   | 1.98 | 1-15/32 | 37.39 | 9/16   | 14.27 | 1      | 25.40 | 1.062  | 26.97 | 31/32   | 24.59 | 1-9/32 | 32.54 | 7/8-20            |
| 16             | 1 -20             | 1/8    | 3.18 | 1-57/64 | 47.85 | 3/4    | 19.05 | 1      | 25.40 | 1.062  | 26.97 | 31/32   | 24.59 | 1-9/32 | 32.54 | 7/8-20            |
| 18             | 1-1/8-18          | 1/8    | 3.18 | 1-63/64 | 50.24 | 3/4    | 19.05 | 1-1/8  | 28.58 | 1.188  | 30.18 | 1-1/16  | 26.97 | 1-3/8  | 34.93 | 1 -20             |
| 20             | 1-1/4-18          | 1/8    | 3.18 | 1-57/64 | 47.85 | 3/4    | 19.05 | 1-1/4  | 31.75 | 1.312  | 33.32 | 1-5/32  | 29.36 | 1-1/2  | 38.10 | 1-3/16-18         |
| 22             | 1-3/8-18          | 1/8    | 3.18 | 1-63/64 | 50.24 | 3/4    | 19.05 | 1-3/8  | 34.93 | 1.438  | 36.53 | 1-1/4   | 31.75 | 1-5/8  | 39.67 | 1-3/16-18         |
| 24             | 1-1/2-18          | 1/8    | 3.18 | 2-1/4   | 57.15 | 13/16  | 20.62 | 1-1/2  | 38.10 | 1.562  | 36.67 | 1-3/8   | 34.93 | 1-3/4  | 44.45 | 1-7/16-18         |
| 28             | 1-3/4-18          | 1/8    | 3.18 | 2-1/4   | 57.15 | 13/16  | 20.62 | 1-3/4  | 44.45 | 1.812  | 46.02 | 1-9/16  | 39.67 | 2      | 50.80 | 1-7/16-18         |
| 32             | 2 -18             | 1/8    | 3.18 | 2-3/8   | 60.33 | 7/8    | 22.23 | 2-1/32 | 51.59 | 2.062  | 52.37 | 1-3/4   | 44.45 | 2-1/4  | 57.15 | 1-3/4-18          |
| 36             | 2-1/4-16          | 1/8    | 3.18 | 2-3/8   | 60.33 | 7/8    | 22.23 | 2-1/4  | 57.15 | 2.312  | 58.72 | 1-15/16 | 49.20 | 2-1/2  | 63.50 | 2 -18             |

## MS3102A

| Connector Size | A Coupling Thread | K Ref. |      | L Max.  |       | M Ref. |       | N Ref.  |       | O Ref. |       | R Ref.  |       | S Ref. |       |
|----------------|-------------------|--------|------|---------|-------|--------|-------|---------|-------|--------|-------|---------|-------|--------|-------|
|                |                   | Inch   | mm   | Inch    | mm    | Inch   | mm    | Inch    | mm    | Inch   | mm    | Inch    | mm    | Inch   | mm    |
| 8S             | 1/2-28            | 5/64   | 1.98 | 55/64   | 21.82 | 9/16   | 14.27 | 7/16    | 11.10 | .562   | 14.27 | 19/32   | 15.06 | 7/8    | 22.23 |
| 10S            | 5/8-24            | 5/64   | 1.98 | 55/64   | 21.82 | 9/16   | 14.27 | 1/2     | 12.70 | .688   | 17.48 | 23/32   | 18.24 | 1      | 25.40 |
| 10SL           | 5/8-24            | 5/64   | 1.98 | 61/64   | 24.21 | 35/64  | 13.87 | 11/16   | 17.48 | .812   | 20.62 | 23/32   | 18.24 | 1      | 25.40 |
| 12S            | 3/4-20            | 5/64   | 1.98 | 31/32   | 24.61 | 9/16   | 14.27 | 11/16   | 17.45 | .812   | 20.62 | 13/16   | 20.62 | 1-3/32 | 27.76 |
| 12             | 3/4-20            | 5/64   | 1.98 | 1-21/64 | 33.73 | 3/4    | 19.05 | 11/16   | 17.45 | .812   | 20.62 | 13/16   | 20.62 | 1-3/32 | 27.76 |
| 12SL           | 3/4-20            | 5/64   | 1.98 | 27/32   | 21.44 | 35/64  | 13.87 | 11/16   | 17.45 | .938   | 23.83 | 13/16   | 20.62 | 1-3/32 | 27.76 |
| 14S            | 7/8-20            | 5/64   | 1.98 | 61/64   | 24.21 | 9/16   | 14.27 | 3/4     | 19.05 | .938   | 23.83 | 29/32   | 23.01 | 1-3/16 | 30.15 |
| 14             | 7/8-20            | 5/64   | 1.98 | 1-11/32 | 34.14 | 3/4    | 19.05 | 3/4     | 19.05 | .938   | 23.83 | 29/32   | 23.01 | 1-3/16 | 30.15 |
| 16S            | 1 -20             | 5/64   | 1.98 | 61/64   | 24.21 | 9/16   | 14.27 | 7/8     | 22.23 | 1.062  | 26.97 | 31/32   | 24.59 | 1-9/32 | 32.54 |
| 16             | 1 -20             | 1/8    | 3.18 | 1-3/8   | 34.92 | 3/4    | 19.05 | 7/8     | 22.23 | 1.062  | 26.97 | 31/32   | 24.59 | 1-9/32 | 32.54 |
| 18             | 1-1/8-18          | 1/8    | 3.18 | 1-3/8   | 34.92 | 3/4    | 19.05 | 1       | 25.40 | 1.188  | 30.18 | 1-1/16  | 26.97 | 1-3/8  | 34.93 |
| 20             | 1-1/4-18          | 1/8    | 3.18 | 1-3/8   | 34.92 | 3/4    | 19.05 | 1-1/8   | 28.58 | 1.312  | 33.32 | 1-5/32  | 29.36 | 1-1/2  | 38.10 |
| 22             | 1-3/8-18          | 1/8    | 3.18 | 1-3/8   | 34.92 | 3/4    | 19.05 | 1-1/4   | 31.75 | 1.438  | 36.53 | 1-1/4   | 31.75 | 1-5/8  | 41.28 |
| 24             | 1-1/2-18          | 1/8    | 3.18 | 1-3/8   | 34.92 | 13/16  | 20.62 | 1-3/8   | 34.93 | 1.562  | 39.67 | 1-3/8   | 34.93 | 1-3/4  | 44.45 |
| 28             | 1-3/4-18          | 1/8    | 3.18 | 1-3/8   | 34.92 | 13/16  | 20.62 | 1-5/8   | 41.28 | 1.812  | 46.02 | 1-9/16  | 39.67 | 2      | 50.80 |
| 32             | 2 -18             | 1/8    | 3.18 | 1-15/32 | 37.31 | 7/8    | 22.23 | 1-29/32 | 48.41 | 2.062  | 52.37 | 1-3/4   | 44.45 | 2-1/4  | 57.15 |
| 36             | 2-1/4-16          | 1/8    | 3.18 | 1-15/32 | 37.31 | 7/8    | 22.23 | 2-1/8   | 53.98 | 2.312  | 58.72 | 1-15/16 | 49.20 | 2-1/2  | 63.50 |

# 97 series solder type plugs with solid shells

## MS3106A

| Connector<br>Size | L Max.  |       | N Ref. |       | Q Max.  |       | V<br>Fitting Threads |
|-------------------|---------|-------|--------|-------|---------|-------|----------------------|
|                   | Inch    | mm    | Inch   | mm    | Inch    | mm    |                      |
| 8S                | 1-1/4   | 31.75 | 17/32  | 13.49 | 3/4     | 19.05 | 1/2-28               |
| 10S               | 1-5/16  | 33.32 | 5/8    | 15.88 | 7/8     | 22.23 | 1/2-28               |
| 10SL              | 1-3/8   | 34.93 | 3/4    | 19.05 | 7/8     | 22.23 | 5/8-24               |
| 12S               | 1-7/16  | 36.50 | 25/32  | 19.84 | 1       | 25.40 | 5/8-24               |
| 12                | 1-7/8   | 47.63 | 25/32  | 19.84 | 1       | 25.40 | 5/8-24               |
| 12SL              | 1-31/64 | 37.69 | 7/8    | 22.23 | 1       | 25.40 | 3/4-20               |
| 14S               | 1-15/32 | 37.13 | 7/8    | 22.23 | 1-1/8   | 28.58 | 3/4-20               |
| 14                | 1-7/8   | 47.47 | 7/8    | 22.23 | 1-1/8   | 28.58 | 3/4-20               |
| 16S               | 1-15/32 | 37.13 | 1      | 25.40 | 1-1/4   | 31.75 | 7/8-20               |
| 16                | 1-7/8   | 47.47 | 1      | 25.40 | 1-1/4   | 31.75 | 7/8-20               |
| 18                | 1-31/32 | 49.88 | 1-1/8  | 28.57 | 1-11/32 | 34.11 | 1 -20                |
| 20                | 1-7/8   | 47.50 | 1-1/4  | 31.75 | 1-15/32 | 37.29 | 1-3/16-18            |
| 22                | 1-31/32 | 49.88 | 1-3/8  | 34.93 | 1-19/32 | 40.46 | 1-3/16-18            |
| 24                | 2-1/4   | 57.15 | 1-1/2  | 38.10 | 1-23/32 | 43.64 | 1-7/16-18            |
| 28                | 2-1/4   | 57.15 | 1-3/4  | 44.45 | 1-31/32 | 49.99 | 1-7/16-18            |
| 32                | 2-3/8   | 60.33 | 2-1/32 | 51.59 | 2-7/32  | 56.34 | 1-3/4-18             |
| 36                | 2-3/8   | 60.33 | 2-1/4  | 57.15 | 2-15/32 | 62.69 | 2 -18                |

### MS3106A straight plug

Sturdy, simple to assemble. Coupling ring machined from solid aluminum bar stock for high tensile strength. Mates with all types of MS receptacles. Front shell includes polarizing keyway. Back shell is threaded for standard MS/AN fittings.

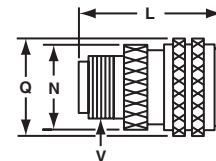


## MS3107A

| Connector<br>Size | L Max.  |       | N Ref. |       | Q Max.  |       | V<br>Fitting Threads |
|-------------------|---------|-------|--------|-------|---------|-------|----------------------|
|                   | Inch    | mm    | Inch   | mm    | Inch    | mm    |                      |
| 10S               | 1-5/16  | 33.32 | 5/8    | 15.88 | 7/8     | 22.23 | 1/2-28               |
| 10SL              | 1-3/8   | 34.92 | 3/4    | 19.05 | 7/8     | 22.23 | 5/8-24               |
| 12S               | 1-7/16  | 36.50 | 25/32  | 19.84 | 1       | 25.40 | 5/8-24               |
| 12                | 1-7/8   | 47.63 | 25/32  | 19.84 | 1       | 25.40 | 5/8-24               |
| 14S               | 1-15/32 | 37.13 | 7/8    | 22.23 | 1-1/8   | 38.58 | 3/4-20               |
| 14                | 1-7/8   | 47.47 | 7/8    | 22.23 | 1-1/8   | 28.58 | 3/4-20               |
| 16S               | 1-15/32 | 37.13 | 1      | 25.40 | 1-1/4   | 31.75 | 7/8-20               |
| 16                | 1-7/8   | 47.47 | 1      | 25.40 | 1-1/4   | 31.75 | 7/8-20               |
| 18                | 1-31/32 | 49.88 | 1-1/8  | 28.58 | 1-11/32 | 34.11 | 1 -20                |
| 20                | 1-7/8   | 47.50 | 1-1/4  | 31.75 | 1-15/32 | 37.29 | 1-3/16-18            |
| 22                | 1-31/32 | 49.88 | 1-3/8  | 34.93 | 1-19/32 | 40.46 | 1-3/16-18            |
| 24                | 2-1/4   | 57.15 | 1-1/2  | 38.10 | 1-23/32 | 43.64 | 1-7/16-18            |
| 28                | 2-1/4   | 57.15 | 1-3/4  | 44.45 | 1-31/32 | 49.99 | 1-7/16-18            |

### MS3107A quick-disconnect plug

For fast connect/disconnect applications. Front shell has polarizing keyway. Mates with all types of MS receptacles. Back shell is threaded for standard MS/AN fittings.



## MS3108A

| Connector<br>Size | L Ref.  |       | Q Max.  |       | U Ref. |       | V<br>Fitting Threads | Y Ref. |       |
|-------------------|---------|-------|---------|-------|--------|-------|----------------------|--------|-------|
|                   | Inch    | mm    | Inch    | mm    | Inch   | mm    |                      | Inch   | mm    |
| 10S               | 1-1/4   | 31.75 | 7/8     | 22.23 | 7/8    | 22.23 | 1/2-28               | 25/32  | 19.84 |
| 10SL              | 1-5/16  | 33.32 | 7/8     | 22.23 | 1      | 25.40 | 5/8-24               | 1-1/16 | 26.97 |
| 12S               | 1-3/8   | 34.93 | 1       | 25.40 | 1      | 25.40 | 5/8-24               | 1-1/16 | 26.97 |
| 12SL              | 1-3/8   | 34.93 | 1       | 25.40 | 1      | 25.40 | 3/4-20               | 1-1/16 | 26.97 |
| 12                | 1-13/64 | 30.56 | 1       | 25.40 | 1      | 25.40 | 5/8-24               | 1-1/16 | 26.97 |
| 14S               | 1-3/8   | 34.93 | 1-1/8   | 28.58 | 1      | 25.40 | 3/4-20               | 1-1/16 | 26.97 |
| 14                | 1-13/16 | 46.02 | 1-1/8   | 28.58 | 1      | 25.40 | 3/4-20               | 1-1/16 | 26.97 |
| 16S               | 1-1/2   | 38.10 | 1-1/4   | 31.75 | 1-1/8  | 28.58 | 7/8-20               | 1-5/16 | 33.32 |
| 16                | 1-15/16 | 49.20 | 1-1/4   | 31.75 | 1-1/8  | 28.58 | 7/8-20               | 1-5/16 | 33.32 |
| 18                | 1-15/16 | 49.20 | 1-11/32 | 34.11 | 1-1/8  | 28.58 | 1 -20                | 1-5/16 | 33.32 |
| 20                | 2-1/16  | 52.37 | 1-15/32 | 37.29 | 1-5/16 | 33.32 | 1-3/16-18            | 1-5/8  | 42.28 |
| 22                | 2-1/16  | 52.37 | 1-19/32 | 40.46 | 1-5/16 | 33.32 | 1-3/16-18            | 1-5/8  | 42.28 |
| 24                | 2-15/32 | 62.69 | 1-23/32 | 43.64 | 1-1/2  | 38.10 | 1-7/16-18            | 2      | 50.80 |
| 28                | 2-15/32 | 62.69 | 1-31/32 | 49.99 | 1-1/2  | 38.10 | 1-7/16-18            | 2      | 50.80 |

### MS3108A angle plug

For use where space in front of panel or wall is at a premium. Swivel ring and plate combination allow cable take off at any angle relative to front shell polarizing key. Back shell is threaded for standard MS/AN fittings.



# 97 series solder type plugs with split shells

## MS3106B

| Connector<br>Size | L Max.  |       | Q Max.  |       | V<br>Fitting Threads | Y Ref.  |       |
|-------------------|---------|-------|---------|-------|----------------------|---------|-------|
|                   | Inch    | mm    | Inch    | mm    |                      | Inch    | mm    |
| 14S               | 1-11/16 | 42.85 | 1-1/8   | 28.58 | 3/4-20               | 1-5/32  | 29.36 |
| 16S               | 1-11/16 | 42.85 | 1-1/4   | 31.75 | 7/8-20               | 1-1/4   | 31.75 |
| 18                | 2-1/16  | 52.37 | 1-11/32 | 34.11 | 1 -20                | 1-41/64 | 41.66 |
| 20                | 2-1/8   | 53.98 | 1-15/32 | 37.29 | 1-3/16-18            | 1-13/16 | 46.02 |
| 22                | 2-1/8   | 53.98 | 1-19/32 | 40.46 | 1-3/16-18            | 1-15/16 | 49.20 |
| 24                | 2-9/32  | 57.94 | 1-23/32 | 43.64 | 1-7/16-18            | 2-1/16  | 52.37 |
| 28                | 2-9/32  | 57.94 | 1-31/32 | 49.99 | 1-7/16-18            | 2-5/16  | 58.72 |
| 32                | 2-5/16  | 58.72 | 2-7/32  | 56.34 | 1-3/4-18             | 2-19/32 | 65.86 |
| 36                | 2-11/32 | 59.51 | 2-15/32 | 62.69 | 2 -18                | 2-27/32 | 72.21 |

## MS3107B

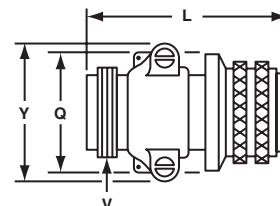
| Connector<br>Size | L Max.  |       | Q Max.  |       | V<br>Fitting Threads | Y Ref.  |       |
|-------------------|---------|-------|---------|-------|----------------------|---------|-------|
|                   | Inch    | mm    | Inch    | mm    |                      | Inch    | mm    |
| 14S               | 1-11/16 | 42.85 | 1-1/8   | 28.58 | 3/4-20               | 1-5/32  | 29.36 |
| 16S               | 1-11/16 | 42.85 | 1-1/4   | 31.75 | 7/8-20               | 1-1/4   | 31.75 |
| 18                | 2-1/16  | 52.37 | 1-11/32 | 34.11 | 1 -20                | 1-41/64 | 41.66 |
| 20                | 2-1/8   | 53.99 | 1-15/32 | 37.29 | 1-3/16-18            | 1-13/16 | 46.02 |
| 22                | 2-1/8   | 53.99 | 1-19/32 | 40.46 | 1-3/16-18            | 1-15/16 | 49.20 |
| 24                | 2-9/32  | 57.94 | 1-23/32 | 43.64 | 1-7/16-18            | 2-1/16  | 52.37 |
| 28                | 2-9/32  | 57.94 | 1-31/32 | 49.99 | 1-7/16-18            | 2-5/16  | 58.72 |

## MS3108B

| Connector<br>Size | L Ref.  |       | Q Max.  |       | U Ref.  |       | V<br>Fitting Threads | X Ref.  |       |
|-------------------|---------|-------|---------|-------|---------|-------|----------------------|---------|-------|
|                   | Inch    | mm    | Inch    | mm    | Inch    | mm    |                      | Inch    | mm    |
| 10S               | 1-3/8   | 34.93 | 7/8     | 22.23 | 7/8     | 22.23 | 1/2-28               |         |       |
| 10SL              | 1-1/2   | 38.10 | 7/8     | 22.23 | 1       | 25.40 | 5/8-24               |         |       |
| 12S               | 1-9/16  | 39.67 | 1       | 25.40 | 1       | 25.40 | 5/8-24               | 1/2     | 12.70 |
| 12                | 1-7/8   | 47.63 | 1       | 25.40 | 1       | 25.40 | 5/8-24               | 1/2     | 12.70 |
| 14S               | 1-23/32 | 43.64 | 1-1/8   | 28.58 | 1-1/16  | 26.97 | 3/4-20               | 21/32   | 16.66 |
| 14                | 1-15/16 | 49.20 | 1-1/8   | 28.58 | 1-1/16  | 26.97 | 3/4-20               | 21/32   | 16.66 |
| 16S               | 1-3/4   | 44.45 | 1-1/4   | 31.75 | 1-1/8   | 28.58 | 7/8-20               | 1-1/2   | 38.10 |
| 16                | 2-1/8   | 53.98 | 1-1/4   | 31.75 | 1-1/8   | 28.58 | 7/8-20               | 1-1/2   | 38.10 |
| 18                | 2-5/32  | 54.75 | 1-11/32 | 34.11 | 1-3/16  | 30.15 | 1 -20                | 1-41/64 | 41.66 |
| 20                | 2-3/8   | 60.33 | 1-15/32 | 37.29 | 1-5/16  | 33.32 | 1-3/16-18            | 1-13/16 | 46.02 |
| 22                | 2-13/32 | 61.11 | 1-19/32 | 40.46 | 1-5/16  | 33.32 | 1-3/16-18            | 1-15/16 | 49.20 |
| 24                | 2-5/8   | 66.68 | 1-23/32 | 43.64 | 1-7/16  | 36.50 | 1-7/16-18            | 2-1/16  | 52.37 |
| 28                | 2-5/8   | 66.68 | 1-31/32 | 49.99 | 1-7/16  | 36.50 | 1-7/16-18            | 2-5/16  | 58.72 |
| 32                | 2-13/16 | 71.42 | 2-7/32  | 56.34 | 1-3/4   | 44.45 | 1-3/4-18             | 2-19/32 | 65.86 |
| 36                | 2-27/32 | 72.21 | 2-15/32 | 62.69 | 1-15/16 | 49.20 | 2 -18                | 2-27/32 | 72.21 |

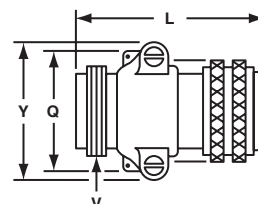
### MS3106B straight plug

Used for unusual conduit applications where soldering and inspection is the prime requirement. Back shell is threaded for all standard MS/AN fittings.



### MS3107B quick-disconnect plug

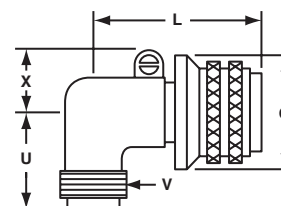
For fast connect/disconnect applications. Front shell has polarizing keyway. Mates with all types of MS receptacles. Back shell is threaded for standard MS/AN fittings.



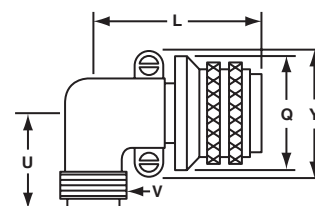
### MS3108B angle plug

Lightweight, roomy cavity, split longitudinally for convenient solder or inspection. Front shell is keyed to allow the 90° angle housing to be rotated and locked at any 45° increment.

#### Sizes 10S thru 14



#### Sizes 16S thru 40



# 97 series solder type

## availability and weight reference

| Insert<br>Number | Wall<br>Receptacles<br>MS3100 | Cable<br>Receptacles<br>MS3101 | Box<br>Receptacles<br>MS3102 | Straight Plugs<br>MS3106 |             | Quick Disconnect<br>Plugs MS3107 |             | Angle Plugs<br>MS3108 |             | Total<br>Contacts |
|------------------|-------------------------------|--------------------------------|------------------------------|--------------------------|-------------|----------------------------------|-------------|-----------------------|-------------|-------------------|
|                  | Solid Shell                   | Solid Shell                    | Solid Shell                  | Solid Shell              | Split Shell | Solid Shell                      | Split Shell | Solid Shell           | Split Shell |                   |
|                  | A                             | A                              | A                            | A                        | B           | A                                | B           | A                     | B           |                   |
| 8S-1             | .02                           | .01                            | .01                          | .02                      |             |                                  |             |                       |             | 1                 |
| 10SL-3P          | .03                           | .03                            | .02                          |                          |             |                                  |             |                       |             | 3                 |
| 10SL-3S          |                               |                                |                              | .03                      |             | .03                              |             | .06                   | .05         | 3                 |
| 10SL-4P†         | .02                           | .02                            | .02                          |                          |             |                                  |             |                       |             | 2                 |
| 10SL-4S†         |                               |                                |                              | .03                      |             | .03                              |             | .06                   | .05         | 2                 |
| 12S-3            | .04                           | .03                            | .03                          | .03                      |             | .03                              |             | .07                   | .07         | 2                 |
| 12-5             | .05                           | .04                            | .03                          | .06                      |             | .06                              |             | .09                   | .08         | 1                 |
| 12S-6*           | .04                           | .03                            | .03                          | .04                      |             | .04                              |             | .07                   | .08         | 2                 |
| 12SL-844P*       |                               |                                | .03                          |                          |             |                                  |             |                       |             | 4                 |
| 12SL-844S*       |                               |                                |                              | .05                      |             | .06                              |             | .08                   |             | 4                 |
| 14S-1†           | .05                           | .04                            | .03                          | .06                      | .06         | .06                              | .06         | .08                   | .08         | 3                 |
| 14S-2            | .05                           | .04                            | .03                          | .06                      | .06         | .06                              | .06         | .08                   | .08         | 4                 |
| 14S-4†           | .05                           | .04                            | .03                          | .06                      | .06         | .06                              | .06         | .08                   | .08         | 1                 |
| 14S-5            | .05                           | .04                            | .04                          | .06                      | .06         | .06                              | .06         | .08                   | .08         | 5                 |
| 14S-6            | .05                           | .04                            | .04                          | .06                      | .06         | .06                              | .06         | .08                   | .08         | 6                 |
| 14S-7            | .05                           | .04                            | .03                          | .06                      | .06         | .06                              | .06         | .08                   | .08         | 3                 |
| 14S-9†           | .05                           | .04                            | .03                          | .06                      | .06         | .07                              | .06         | .08                   | .08         | 2                 |
| 16S-1            | .06                           | .05                            | .05                          | .07                      | .07         | .08                              | .07         | .14                   | .11         | 7                 |
| 16S-4            | .06                           | .05                            | .04                          | .07                      | .07         | .07                              | .07         | .12                   | .10         | 2                 |
| 16S-5†           | .06                           | .05                            | .04                          | .07                      | .07         | .07                              | .07         | .12                   | .10         | 3                 |
| 16S-6†           | .06                           | .05                            | .04                          | .07                      | .07         | .09                              | .07         | .12                   | .10         | 3                 |
| 16-7             | .08                           | .08                            | .07                          | .09                      |             | .07                              |             | .15                   | .14         | 3                 |
| 16S-8            | .06                           | .05                            | .04                          | .07                      | .07         | .09                              | .07         | .12                   | .10         | 5                 |
| 16-9             | .08                           | .07                            |                              | .09                      |             | .09                              | .10         | .12                   | .13         | 4                 |
| 16-10            | .08                           | .08                            | .07                          | .09                      |             | .09                              |             | .15                   | .14         | 3                 |
| 16-11†           | .08                           | .07                            | .07                          | .09                      |             | .11                              |             | .14                   | .13         | 2                 |
| 16-12            | .10                           | .09                            | .08                          | .11                      |             | .08                              |             | .16                   | .15         | 1                 |
| 16-13            | .07                           | .07                            | .06                          | .08                      |             | .11                              |             | .14                   | .13         | 2                 |
| 18-1             | .10                           | .10                            | .08                          | .11                      | .13         | .12                              | .13         | .16                   | .15         | 10                |
| 18-3†            | .10                           | .10                            | .08                          | .12                      | .13         | .11                              | .13         | .16                   | .15         | 2                 |
| 18-4             | .09                           | .09                            | .07                          | .11                      | .13         | .12                              | .13         | .16                   | .15         | 4                 |
| 18-5             | .10                           | .10                            | .08                          | .12                      | .13         | .13                              | .13         | .16                   | .15         | 3                 |
| 18-8             | .10                           | .10                            | .08                          | .12                      | .14         | .12                              | .14         | .16                   | .15         | 8                 |
| 18-9             | .11                           | .10                            | .09                          | .12                      | .14         | .13                              | .14         | .17                   | .16         | 7                 |
| 18-10†           | .11                           |                                | .09                          | .13                      | .14         | .13                              | .14         | .17                   | .16         | 4                 |
| 18-11            | .11                           | .11                            | .09                          | .13                      | .15         | .11                              | .15         | .18                   | .17         | 5                 |
| 18-12†           | .10                           | .09                            | .08                          | .11                      | .13         | .13                              | .13         | .16                   | .15         | 6                 |
| 18-13            | .12                           | .12                            | .10                          | .13                      | .15         | .13                              | .15         | .18                   | .17         | 4                 |
| 18-16            | .09                           | .09                            | .07                          | .11                      | .13         | .11                              | .13         | .15                   | .14         | 1                 |
| 18-19†           | .10                           | .10                            | .08                          | .11                      | .13         | .11                              | .13         | .16                   | .15         | 10                |
| 18-20†           | .09                           | .09                            | .07                          | .11                      | .13         | .11                              | .13         | .15                   | .15         | 5                 |
| 18-22†           | .09                           | .09                            | .07                          | .11                      | .13         |                                  | .13         | .16                   | .15         | 3                 |
| 18-29†           | .10                           |                                | .08                          | .11                      | .13         | .11                              | .13         | .16                   | .15         | 5                 |
| 18-420†*         | .10                           | .10                            | .08                          | .12                      | .13         | .12                              | .13         | .16                   | .16         | 1                 |
| 20-3†            | .14                           | .13                            | .10                          | .15                      | .16         | .15                              | .16         | .24                   | .19         | 3                 |

Where no weight is shown, insert is not available in that shell type.

† Inactive for new military design, but available for replacement or for non-military purposes.

\* "MS" number not assigned. Use "97" prefix in place of "MS" in completing catalog number.

Weights are for connectors with socket contacts.

Connectors with pin contacts weigh slightly less.

If a weight appears in the column, the shell is available.

Weight is shown in lbs.

# 97 series solder type

## availability and weight reference, cont.

| Insert Number | Wall Receptacles MS3100 | Cable Receptacles MS3101 | Box Receptacles MS3102 | Straight Plugs MS3106 |             | Quick Disconnect Plugs MS3107 |             | Angle Plugs MS3108 |             | Total Contacts |
|---------------|-------------------------|--------------------------|------------------------|-----------------------|-------------|-------------------------------|-------------|--------------------|-------------|----------------|
|               | Solid Shell             | Solid Shell              | Solid Shell            | Solid Shell           | Split Shell | Solid Shell                   | Split Shell | Solid Shell        | Split Shell |                |
|               | A                       | A                        | A                      | A                     | B           | A                             | B           | A                  | B           |                |
| 20-4          | .14                     | .13                      | .10                    | .15                   | .16         | .15                           | .16         | .24                | .19         | 4              |
| 20-6†         | .12                     | .11                      | .09                    | .13                   | .15         | .14                           | .15         | .23                | .18         | 3              |
| 20-7          | .13                     | .12                      | .09                    | .14                   | .15         | .14                           | .15         | .23                | .18         | 8              |
| 20-8          | .15                     | .14                      | .12                    | .16                   | .18         | .16                           | .18         | .26                | .20         | 6              |
| 20-11†        | .14                     | .13                      | .11                    | .15                   | .17         | .15                           | .17         | .25                | .20         | 13             |
| 20-14         | .16                     | .15                      | .13                    | .17                   | .19         | .17                           | .19         | .27                | .21         | 5              |
| 20-15         | .15                     | .14                      | .12                    | .16                   | .18         | .16                           | .18         | .26                | .21         | 7              |
| 20-16         | .14                     | .13                      | .10                    | .15                   | .16         | .15                           | .16         | .24                | .19         | 9              |
| 20-17         | .15                     | .14                      | .11                    | .16                   | .17         | .16                           | .17         | .25                | .20         | 6              |
| 20-18         | .14                     | .13                      | .11                    | .15                   | .17         | .15                           | .17         | .25                | .19         | 9              |
| 20-19†        | .16                     | .15                      | .13                    | .17                   | .19         | .17                           | .19         | .27                | .21         | 3              |
| 20-21         | .13                     | .12                      | .10                    | .14                   | .16         | .14                           | .16         | .24                | .19         | 9              |
| 20-23†        | .15                     | .14                      | .11                    | .16                   | .17         | .16                           | .17         | .25                | .20         | 2              |
| 20-24         | .15                     | .14                      | .11                    | .16                   | .17         | .16                           | .17         | .25                | .20         | 4              |
| 20-27         | .13                     | .12                      | .10                    | .14                   | .16         | .14                           | .16         | .24                | .19         | 14             |
| 20-29         | .14                     | .13                      | .11                    | .15                   | .17         | .15                           | .17         | .25                | .20         | 17             |
| 20-33         | .13                     | .12                      | .09                    | .14                   | .18         | .18                           | .18         | .23                | .18         | 11             |
| 22-1†         | .16                     | .16                      | .13                    | .18                   | .19         | .18                           | .19         | .27                | .23         | 2              |
| 22-2          | .17                     | .17                      | .14                    | .19                   | .20         | .19                           | .20         | .29                | .24         | 3              |
| 22-4†         | .21                     | .17                      | .14                    | .19                   | .20         | .19                           | .20         | .28                | .23         | 4              |
| 22-5          | .15                     | .14                      | .12                    | .17                   | .18         | .17                           | .18         | .26                | .21         | 6              |
| 22-8†         | .15                     | .14                      | .11                    | .16                   | .18         | .16                           | .18         | .26                | .21         | 2              |
| 22-9          | .15                     | .15                      | .12                    | .17                   | .18         | .17                           | .18         | .26                | .21         | 3              |
| 22-10         | .14                     | .13                      | .10                    | .15                   | .17         | .15                           | .17         | .25                | .20         | 4              |
| 22-11         | .14                     | .13                      | .10                    | .15                   | .17         | .15                           | .17         | .25                | .20         | 2              |
| 22-12         | .16                     | .16                      | .13                    | .18                   | .19         | .18                           | .19         | .27                | .23         | 5              |
| 22-13†        | .16                     | .15                      | .12                    | .17                   | .18         | .17                           | .18         | .27                | .22         | 5              |
| 22-14         | .15                     | .14                      | .11                    | .16                   | .18         | .16                           | .18         | .26                | .21         | 19             |
| 22-15         | .16                     | .14                      | .13                    | .17                   | .19         | .17                           | .19         | .27                | .22         | 6              |
| 22-16†        | .16                     | .15                      | .12                    | .17                   | .18         | .17                           | .18         | .27                | .22         | 9              |
| 22-18         | .14                     | .13                      | .10                    | .15                   | .17         | .15                           | .17         | .25                | .20         | 8              |
| 22-19         | .15                     | .14                      | .11                    | .16                   | .18         | .16                           | .18         | .26                | .21         | 14             |
| 22-20†        | .14                     | .14                      | .11                    | .16                   | .17         | .16                           | .17         | .25                | .21         | 9              |
| 22-22         | .19                     | .19                      | .16                    | .21                   | .26         | .21                           | .22         | .30                | .25         | 4              |
| 22-23         | .17                     | .16                      | .13                    | .18                   | .20         | .18                           | .20         | .28                | .23         | 8              |
| 22-26†        | .15                     | .14                      | .11                    |                       |             |                               |             |                    | .19         | 7              |
| 22-27         | .15                     | .15                      | .12                    | .17                   | .18         | .17                           | .18         | .27                | .22         | 9              |
| 22-28†        | .17                     | .16                      | .13                    | .18                   | .20         | .18                           | .20         | .28                | .23         | 7              |
| 22-34†        | .15                     | .15                      | .12                    | .17                   | .18         | .17                           | .18         | .26                | .22         | 5              |
| 24-2          | .20                     | .19                      | .16                    | .22                   | .24         | .22                           | .24         | .39                | .29         | 7              |
| 24-5†         | .18                     | .17                      | .14                    | .20                   | .22         | .20                           | .22         | .37                | .27         | 16             |
| 24-6          | .20                     | .19                      | .16                    | .22                   | .24         | .22                           | .27         | .39                | .29         | 8              |
| 24-7          | .19                     | .18                      | .14                    | .21                   | .23         | .21                           | .23         | .38                | .27         | 16             |
| 24-9†         | .22                     | .21                      | .17                    | .24                   | .25         | .24                           | .25         | .41                | .30         | 2              |
| 24-10         | .26                     | .25                      | .21                    | .28                   | .30         | .28                           | .30         | .45                | .34         | 7              |

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