AEROSPACE STANDARD

AS81306™	REV. A

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Superseding AS81306

(R) Wiring Installation Tools for Bands and Tiedown Straps

RATIONALE

Revision required to add the AS81306/2 tool reference and add the tool marking requirements under 3.0 to comply with the AIR1351 identification requirements.

AS81306A has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

This specification covers tools used to install tiedown straps on wire bundles and for installing connector accessory shield termination bands (see 6.1).

2. REFERENCES

2.1 APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR1351	Manufacturer's Identification of Aerospace Electrical and Electronic Wiring Devices and Accessories
AS23190	Wiring, Positioning, and Support Accessories
AS81306/1	Band Installation Tool, Hand, One-Step for AS85049/128 Connector Accessory Cable Shield Terminating Bands
AS81306/2	Band Installation Tool, Hand, Two-Step for AS85049/128 Connector Accessory Cable Shield Terminating Bands
AS85049/128	Connector Accessories, Electrical Backshell, Shield Band, Category 7 (For AS85049/82 - /90, /93, /109 - /117 Accessories)
AS90387	Wiring Installation Hand Tools for Metal and Plastic Straps

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AS81306A/

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM-A666 Steel Sheet, Strip, Plate and Flat Bar, Austenitic Stainless, Annealed or Cold-Worked

ASTM-D4066 Nylon Injection and Extrusion Materials (PA)

2.1.3 National Conference of Standards Laboratories (NCSL) Publications

Available from NCSL International, 2995 Wilderness Place, Suite 107, Boulder, CO 80301, Tel: 303-440-3339, www.ncsli.org.

NCSL Z540 General Requirements for Calibration Laboratories and Measuring and Test Equipment

2.1.4 U.S. Government Publications

Copies of these documents are available online at http://quicksearch.dla.mil.

MIL-STD-202 Test Method Standard Electronic and Electrical Component Parts

MIL-STD-1916 Department of Defense Preferred Methods for Acceptance of Product

SD-6 Provisions Governing Qualification

2.2 Definitions

2.2.1 Smallest Tiedown Strap or Band: The smallest tiedown strap or band is the thinnest and narrowest strap or band accommodated by the tool.

2.2.2 Largest Tiedown Strap or Band: The largest tiedown strap or band is the thickest and widest strap or band accommodated by tool.

2.2.3 SAE Preparing Activity: An SAE Preparing Activity (PA) is an SAE Committee that has prepared and is responsible for the standard (see end of document).

2.2.4 Qualifying Activity (QA): A Qualifying Activity is a function established by the standard which has a defined product validation process used to consistently evaluate all Suppliers' products in accordance with the Qualification Inspection requirements (see 6.3).

2.2.5 Purchaser: A purchaser is an activity that can issue a purchase order or contract.

2.2.6 Supplier: A supplier is a manufacturer or a value-added manufacturer which has design and production control of the processes used to produce the final component in accordance with the standard.

3. REQUIREMENTS

3.1 Detail Specification (see 6.1)

The individual item requirements shall be as specified herein and in accordance with the applicable detail specification. In the event of any conflict between the requirements of this specification and the detail specification, the latter shall govern.

3.2 Materials and Components (see 6.1)

Materials and components used in the fabrication of tools covered by this specification shall be capable of meeting the requirements of this specification and the detail specifications.

3.3 Design and Construction (see 6.1)

The tool shall consist of all components required to attach the assembly to the component and sever end of the strap or connector accessory band. The tool shall be constructed to withstand stress, shock, vibration, and any other conditions incident to service use. The design shall provide for rigidity of parts and resistance to fatigue. The frame of the tool shall be as specified in the detail specification. Provision shall be made to guide the strap or connector accessory band into the working position in the tool. The installation tool, including all parts, shall be so constructed and finished that it shall be free from all defects that may affect proper functioning in service. There shall be no sharp edges, burrs, or other defects that are potential hazards to the operator of the tool .Unless otherwise specified, the tool shall be hand operated and capable of applying a tiedown strap or connector accessory band to their respective components.

3.3.1 Dimensions (see 6.2)

The installation tool dimensions shall be as specified in detail specification.

3.3.2 Tiedown Strap Tool Spring Return of Handle (see 6.3)

The handle of the tool shall return freely and immediately to the fully opened position when released after the tension and cutting operation has been completed. This action shall apply with the tool in any plane or position, with or without a strap or position in the tool.

3.3.3 Band Tool Return of Handle (see 6.4)

The handle of the band tool shall remain in the closed position once the predetermined tension has been achieved. The handle of the tool shall then return freely and immediately to the fully opened position after the cutting operation has been completed. This action shall apply with the tool in any plane or position with a connector accessory band positioned in the tool.

3.3.4 Tiedown Strap Tool Gripping Device (see 6.5)

The tool gripping device shall be spring-loaded, contact the strap when the handle is depressed and advance the strap a minimum of 3/16 of an inch with each stroke of the handle. After installation of the strap around the wire bundle has been completed, the gripping device shall return to its original position freely as the handle is opened.

3.3.5 The Band Tool Gripping Device (see 6.5 S/B 6.6)

The band tool gripping device shall contact the connector accessory band when the handle is depressed and advance the connector accessory band a minimum of 5/32 of an inch with each stroke of the handle. After installation of the connector accessory band is completed the tool gripping device shall return to its original position.

3.3.6 Operating Instructions (see 3.1)

Each tool shall be provided with operating instructions. The instruction shall provide as a minimum a gauging method, a calibration method if required, replacement part numbers, and instruction needed to insure the safe operation and storage of the tool.

3.3.7 Marking Requirements (see 6.1)

Marking shall be as specified on the individual detail specification. Qualified suppliers symbols or trademark shall be listed in AIR1351.

4. PERFORMANCE

4.1 High Compression Force (see 6.7)

The tool shall meet the normal compression force requirement after applying a high compression force.

4.2 Tiedown Strap Normal Compression Force (see 6.8)

The normal compression force in Table 1 shall not be exceeded.

Table 1 - Tiedown strap normal compression forces

Tool	Compression Force (lbs max)
MS90387-1	50
MS90387-2	100
MS90387-3 1/	125
MS90387-4	100
MS90387-5	50

1/ Metal stock required.

4.3 Band Normal Compression Force (see 6.9)

The normal compression force shall be as specified in the detail specification.

4.4 Tiedown Tool Strap Tensile Strength (see 6.10)

The tiedown strap tensile strength shall be accordance with the AS23190 tiedown strap requirement specified for the tool.

4.5 Band Tool Linear Pull Force (see 6.11)

The band linear pull force shall be as specified the detail specification.

4.6 Life Cycle (see 6.12)

Unless otherwise specified in the detail specification, the tool shall withstand a total of 15000 tension and cut cycles.

4.7 Corrosion (see 6.13)

After exposure the tiedown strap or band shall comply with Low Temperature Performance.

4.8 Low Temperature Performance (see 6.13.1)

The tool shall perform at -15 ºC ± 2 ºC. After exposure as specified, the tiedown tool shall comply with the Tensile Strength requirement and the band tool shall comply with Band Linear Pull Force requirement.

5. QUALITY ASSURANCE

5.1 Responsibility for Inspection

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all contract inspection requirements as specified herein. Except as otherwise specified herein or in the contract or purchase order, the supplier may use any facilities suitable for the performance of the inspection requirements. The purchaser or Qualifying Activity has the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

5.2 Responsibility for Compliance

All items must meet all technical requirements of the product standard. The inspection set forth in this standard shall become a part of the supplier's overall inspection system or quality program. The absence of any inspection requirements in the standard shall not relieve the supplier of the responsibility of assuring that all products comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the purchaser to acceptance of defective material.

5.3 Test Equipment and Inspection Facilities

Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the supplier. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with NCSL Z540 or equivalent standards.

5.3.1 Test Conditions

Unless otherwise specified herein, all tests shall be conducted at ambient temperature of 27 °C ± 10 °C (80 °F ± 10 °F) and a relative humidity up to 90%. Barometric pressure; prevailing room conditions.

5.4 Classification of Inspections

The inspections specified herein are classified as follows:

a. Qualification inspection (see 5.6)

b. Periodic qualification inspection (see 5.10)

c. Quality conformance inspection (see 5.11)

5.5 Inspection Conditions

The conditions for the inspections are specified as applicable and all test data shall be compiled in accordance with an acceptable method, such as chapter 4 of SD-6. Qualification cannot begin until receipt of an authorization letter to begin testing. The supplier shall provide to the Qualifying Activity for approval a general test plan describing how the requirements of the authorization letter will be performed (i.e., test schedule, similarity requests, issues, etc).

5.6 Qualification Inspection

Qualification testing shall be performed in accordance with a Qualifying Activity test authorization letter (see 5.5). The Qualifying Activity shall develop initial qualification data in accordance with Table 2. The supplier shall develop initial qualification inspection data in accordance with Table 3 in a laboratory approved by the Qualifying Activity.

Table 2 - Qualifying activity test requirements

Technical Requirement	Requirement Paragraph	Test Method Paragraph	Tool Samples
Materials and Components	3.2	6.1	2 2/
Design and Construction	3.3	6.1	
Dimensions	3.3.1	6.2	
Operating Instructions	3.3.6	3.1	
Life Cycle 1/	4.6	6.12	1
Corrosion 3/	4.7	6.13	1

1/ Required only for initial qualification.
2/ Use one tool for Life Cycle test and one tool for Corrosion test.
3/ Periodic Qualification Inspection test perform every 72 months.

Table 3 - Supplier test requirements

Technical Requirement	Requirement Paragraph	Test Method Paragraph	Quality Conformance	Tool Sample
Dimensions 1/	3.3.1	6.2	5.11	2
Tiedown Strap Spring Return of Handle	3.3.2	6.3	5.11	
Band Tool Return of Handle	3.3.3	6.4		
Tiedown Strap Gripping Device	3.3.4	6.5	5.11	
Band Gripping Device	3.3.5	6.6		
High Compression Force	4.1	6.7		
Tiedown Strap Normal Compression Force	4.2	6.8		
Band Normal Compression Force	4.3	6.9		
Tiedown Strap Tensile Strength	4.4	6.10	5.11 2/	
Band Linear Pull Force	4.5	6.11	5.11	

1/ Applicable only for Quality Conformance Examine envelope dimensions only for band tools.
2/ Test on the highest tensile strength tiedown strap to be used with the tool.

5.7 Qualification by Similarity

Qualification by similarity to qualified components or to components submitted for qualification is permissible when materials, designs, and manufacturing processes are similar. Tool application history may be considered by qualifying activity for similarity justification. The manufacturer shall provide to the Qualifying Activity, full details of the similarities and differences of the components and manufacturing processes, and a proposed qualification test program that will address the differences. Testing shall not begin until the manufacturer's proposal has been approved or modified by the Qualifying Activity (see 5.5).

5.8 Qualification Sample

The qualification test samples shall consist of four (4) tools of each type for which qualification is desired (see Tables 2 and 3). The Supplier shall, for each sample, use the same ingredients, manufacturing procedures; and methods of inspection as would be used to provide the product to a Purchaser's contract. Supplier tools may be shipped after approval has been granted by the Qualifying Activity.

5.9 Test Report

The supplier test report shall include the results of Table 3 tests and the requirements of the Qualifying Activity authorization letter. The Qualifying Activity Table 2 data shall be certified and provided to the supplier upon request. The data may be included in the supplier's test report, but is not required.

5.10 Periodic Qualification Inspection

Periodic qualification shall be performed by the Qualifying Activity in accordance with Table 2 at 36 month intervals. Testing cannot begin until an authorization letter has issued. At the Qualifying Activity discretion, the periodic qualification submission date may be adjusted to accommodate laboratory testing schedules. The supplier shall provide to the Qualifying Activity untested samples, components needed for testing, and a summary of quality conformance inspection results for the interval. The Qualifying Activity test data will be certified and provided to the supplier upon request.

5.11 Quality Conformance Inspection

Quality conformance inspection shall be end item inspection on those tests indicated in Table 3. For tiedown strap tools samples shall be selected at random in accordance with MIL-STD-1916 for lot sampling by attributes, verification level 1. For accessory band tool each tool shall be examine for quality conformance inspection. Process controls approved by the Qualifying Activity may be used as alternative to the tests specified. Process control alternatives shall be included in the test plan (see 5.5).

6. TEST METHODS

6.1 Examination of Product (see 3.1, 3.2, 3.3)

Visually examined to determine conformance as specified. Verify that material certifications have been established for each material used in the tool.

6.2 Dimensions (see 3.3.1)

Measure all dimensions specified in the detail specification and all dimensions not specified, but determined to be critical for performance of the tool. Unspecified dimension measurements may be performed by in-process control techniques.

6.3 Tiedown Strap Spring Return of Handle (see 3.3.2)

This test shall be conducted with the smallest and largest strap or band accommodated by the tool (see definitions). The handle and gripping device assembly of the tool shall automatically return to their fully open position upon completion of the tension and cutting operations. The tool shall be tested in the vertical and horizontal planes. When testing in the horizontal plane, the gripping device shall be facing downward.

6.4 Band Tool Return of Handle (see 3.3.3)

This test shall be conducted with the smallest and largest connector accessory band accommodated by the tool (see definitions). The handle and gripping device assembly of the tool shall automatically return to their fully open position upon completion of the tension and cutting operations. The tool shall be tested in the vertical and horizontal planes.

6.5 Tiedown Strap Gripping Device (see 3.3.3)

Perform the test on the smallest and largest tiedown strap specified for the tool (see definitions). Place the tiedown strap through the strap guide and mark the strap at the point of entry into the tool. Close the handle of the tool, bottoming on the stop without cutting the strap. Mark the strap again at the point of entry into the tool. The distance between the marks shall not be less than 3/16 of an inch, indicating the effective stroke length of the tool. The gripping device shall return freely as the handle is opened.

6.6 Band Gripping Device (see 3.3.5)

Perform the test on the smallest and largest connector accessory band specified for the tool (see definitions). Feed the connector accessory band through the tool nose guide until the connector accessory band exists the other side. Mark the connector accessory band at the point of exit from the tool. Close the return handle of the tool without cutting the connector accessory band. Mark the connector accessory band again at the point of exit from the tool. The distance between the marks shall not be less than 5/32 of an inch (does not apply to the final tension strokes), indicating the effective stroke length of the tool. The gripping device shall return freely as the handle is opened.

6.7 High Compression Force (see 4.1)

The tool shall perform satisfactorily after a compression force of 150 pounds is exerted on the tool handle at a point 1 - 0, +1/8 inch from the extremity of the handle.

6.8 Tiedown Strap Normal Compression Force (see 4.2)

The maximum compression force of Table 1 shall not be exceeded when cutting off the largest size tiedown strap accommodated by the tool, at the highest tool tension setting. The compression force shall be measured at a point on the tool handle 1-1/8 inches from the extremity of the handle.

6.9 Band Normal Compression Force (see 4.3)

The maximum compression force specified in the detail specification shall not be exceeded when cutting off the largest size band accommodated by the tool, at the highest tool tension setting when applicable (see definitions). The compression force shall be measured at a point on the tool handle 1-1/8 inches from the extremity of the handle.

6.10 Tiedown Strap Tensile Strength (see 4.4)

Ten tiedown strap specimens shall be subjected to and comply with the tensile test requirement of AS23190. Five specimens shall be the smallest strap and five specimens shall be largest strap accommodated by the tool (see definitions).

6.11 Band Tool Linear Pull Force (see 4.4)

Ten connector accessory band specimens shall be subjected to and comply with the band linear pull force as specified in the AS85049/128 detail specification. Five specimens shall be the smallest connector accessory band and five specimens shall be largest connector accessory band accommodated by the tool (see definitions).

6.12 Life Cycle (see 4.6)

6.12.1 Tiedown Strap Tool

Unstressed polyamide (nylon) stock conforming to ASTM D4066, type PA111 or metal stock conforming to ASTM A666, type 304, 304, or 316 shall be used in lieu of straps. The stock shall have the dimensions specified in Table 4. The nylon or metal stock shall be fed to the tool in such a manner that the action of the gripping device, when the tool is operated, shall exert tension corresponding to the maximum tool tension setting for the strap size being tested. A cycle shall consist of closing the tool through the cutting position and returning the handle to the full open position. After each 2500 cycles, the tool shall be tested for Tiedown Strap Tensile Strength. At no time during this test shall the compression force, required to be exerted on the handles of the tool at a point 1-1/8 inches from the extremity of the handles, exceed that shown in Table 4.

Table 4 - Tiedown strap life cycle conditions

Tool	Nylon Stock Stock		Compression Force (lbs max)
	Thick +.005	Wide + .010	
MS90387-1	.047	.187	50
MS90387-2	.078	.290	100
MS90387-3 1/	.015	.330	125
MS90387-4	.095	.510	100
MS90387-5	.047	.187	50

1/ Metal stock required.

6.12.2 Band Tool

Metal stock conforming to the material specified for the connector accessory band shall be used with the band tool under test. The metal stock shall be fed into the tool in such a manner that the action of the gripping device, when the tool operating handle completes 3 full strokes exerts tension corresponding to the predetermined tool tension setting for the connector accessory band size being tested. A cycle shall consist of closing the tool operation handle and returning the tool operation handle to the full open position; three full strokes. After the first 500 cycles and every 1000 cycles thereafter, a band shall be secured to an accessory. The accessory shall be subjected to the band linear pull force (see 6.11). The predetermined tool tension setting shall then be verified. If the tool is out of tolerance, it shall be recalibrated. If recalibration is required it shall be recorded on the test data sheet.