DE HAVILLAND AIRCRAFT OF CANADA LIMITED

BOMBARDIER

Toronto Site

PPS 10.16 - INSTALLATION OF HEAT SHRINKABLE TUBING, TAPE AND IDENTIFICATION SLEEVES

Issue 13
- This Production Process Standard (PPS) supersedes PPS 10.16, Issue 12.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@dehavilland.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

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Signed original on file. Validation of paper prints is the responsibility of the user.

Issue 13 - Summary of Changes (over the previous issue)

The following summaries are not detailed and are intended only to assist in alerting PPS users to changes which may affect them; refer to the applicable sections of this PPS for detailed procedure and requirements.

- SAE AMS-DTL-23053/5 and SAE AMS-DTL-23053/8 have been superseded by AS23053/5 and AS23053/8 respectively.
- Added AS23053/12 and AS23053/16 tubing.
- Amended Figure 1 to include part number breakdown for AS23053/12 and AS23053/16 tubing.
- Specified maximum temperature for heat shrinkable tubing specified herein.
- Modified insulation sleeve figure. See Figure 3.
- Added installation details for terminal lugs. See section 5.2.2.2.

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the installation of heat shrinkable sleeves, tubing and wrap around marker tape on aircraft parts and assemblies.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS shall be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Refer to PPS 9.17 for the procedure and requirements for encapsulating electrical wire harnesses and cable assemblies, including those fitted with PTFE (Teflon) jacketing, using heat shrinkable tubing, boots and transitions.

1.2 This PPS is co-owned by De Havilland Aircraft of Canada Limited (DHC) and Bombardier Inc. (BA) due to its applicability for both the DHC DASH 8 and BA Lear 45 programs.

2 HAZARDOUS MATERIALS

2.1 Before receipt at DHC or BA, all materials shall be approved and assigned Material Safety Data Sheet (MSDS) numbers by the DHC/BA Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact DHC/BA Environment, Health and Safety Department.

3 REFERENCES

3.1 AS23053 - Insulation Sleeving, Electrical, Heat Shrinkable, General Specification for.

3.2 AS23053/5 - (R) Insulation Sleeving, Electrical, Heat Shrinkable, Polyolefin, Flexible, Crosslinked.

3.3 AS23053/8 - Insulation Sleeving, Electrical, Heat Shrinkable, Polyvinylidene Fluoride, Semi-Rigid, Crosslinked.

3.4 AS23053/12 - Insulation Sleeving, Electrical, Heat Shrinkable, Polytetrafluoroethylene.

3.5 AS23053/16 - Insulation Sleeving, Electrical, Heat Shrinkable, Crosslinked, Elastomeric Polyolefin, Flexible.

3.6 DSC 347 - Sleeves, Heat Shrinkable.

3.7 PPS 9.17 - Encapsulation of Electrical Wire Harnesses and Cable Assemblies.

3.8 PPS 13.26 - General Subcontractor Provisions.

3.9 PPS 31.17 - Solvent Usage.

4 MATERIALS AND EQUIPMENT

4.1 Materials

4.1.1 DSC 347 heat shrinkable part marking/identification sleeves and wrap around markers.

4.1.2 Heat shrinkable tubing, bulk length, M23053/5 (135°C max.) or M23053/8 (175°C max.). See Figure 1 for a part number breakdown.

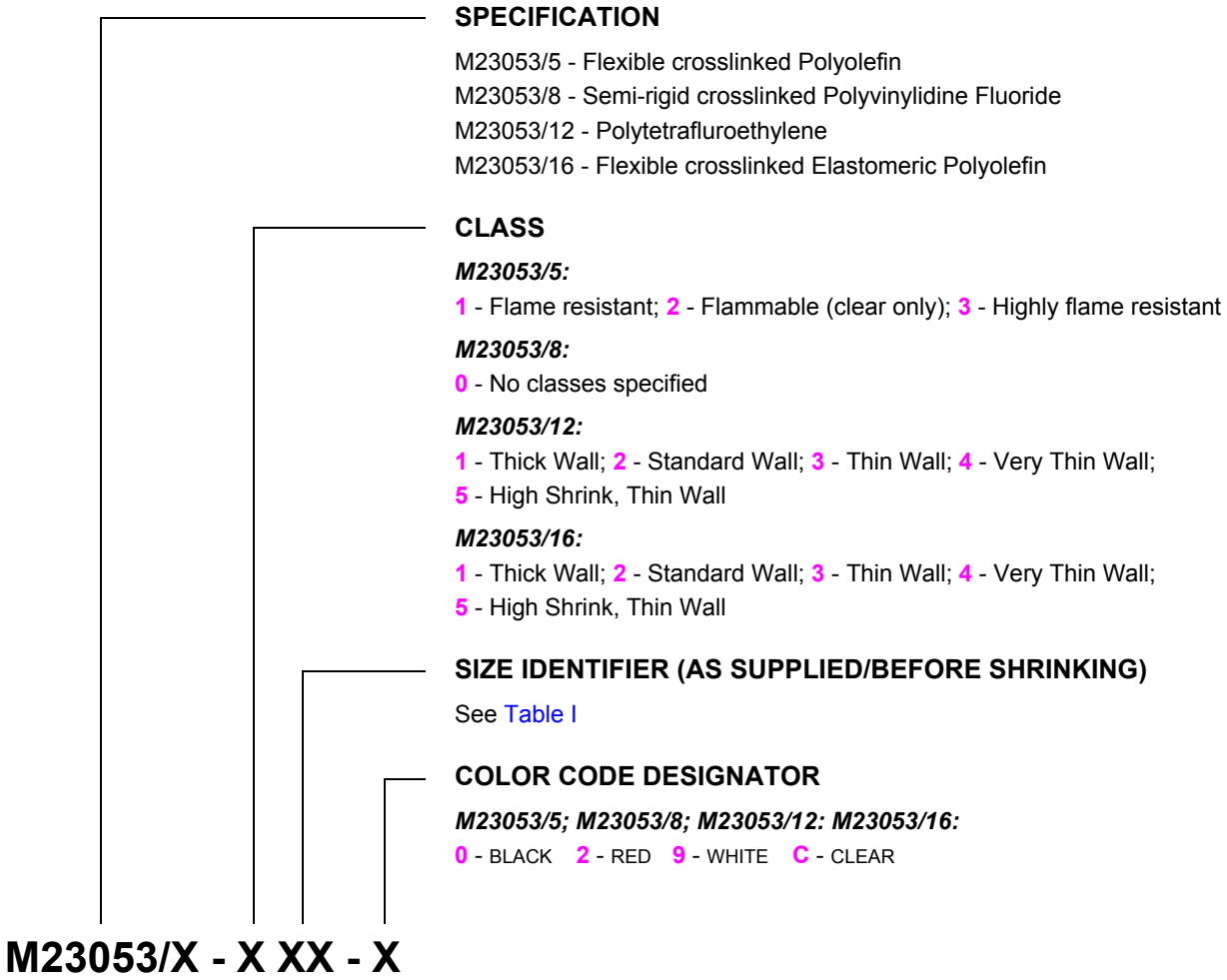


FIGURE 1 - PART NUMBER BREAKDOWN FOR HEAT SHRINKABLE TUBING

4.1.3 Heat shrinkable tubing, high temperature, TE Connectivity RT555 (200°C max.), as specified on the engineering drawing or wiring list.

4.1.4 Heat shrinkable tubing, high temperature, TE Connectivity TFE and TFE-R (250°C max.), to AS23053/12 Class 3 and Class 5, as specified on the engineering drawing or wiring list. See Figure 1 for a part number breakdown.

4.1.5 Heat shrinkable tubing, TE Connectivity DR-25, Black, (150°C max.) to AS23053/16, as specified on the engineering drawing or wiring list. See Figure 1 for a part number breakdown.

TABLE I - M23053 SIZE IDENTIFIER CODE

CODE	PRE-SHRUNK ID SIZE (INCHES) - AS SUPPLIED				
	M23053/5	M23053/8	M23053/12 CLASS 3	M23053/12 CLASS 5	M23053/16
01	0.046		0.034	0.078	0.250
02	0.063		0.038	0.125	0.375
03	0.093		0.046	0.187	0.500
04	0.125		0.050	0.250	0.750
05	0.187		0.055	0.312	1.000
06	0.250		0.060	0.375	1.500
07	0.375		0.065	0.438	2.000
08	0.500		0.076	0.500	3.000
09	0.750		0.085	0.562	4.000
10	1.000		0.093	0.625	-
11	1.500		0.110	0.687	-
12	2.000		0.120	0.750	-
13	3.000		0.140	0.875	-
14	4.000		0.150	1.000	-

4.2 Equipment

4.2.1 Hot air gun, complete with reflector (e.g., Steinel HG 2520E or Steinel STEI-HG 2310-BB). For safety reasons, it is recommended that hot air guns include a power interrupt reset feature which will prevent an unattended heat gun from resuming heat (e.g., after a power failure).

4.2.1.1 Whenever using a hot air gun or heat gun, take care to ensure not to use too high a heat setting. The heat setting used shall be appropriate to the task the hot air gun is being used for without causing damage to parts or surrounding structure. If necessary, use heat guards to protect surrounding structure. If unsure what heat setting to use, start at a lower temperature setting and increase slowly to determine the proper setting.

5 PROCEDURE

5.1 General

5.1.1 Materials used for any particular application shall be as defined on the engineering drawing or PPS.

5.1.2 The installation of heat shrinkable sleeves and tubing as specified herein are used for the following:

- Identification of cable assemblies and components.
- Insulation of various electrical contacts, splices and wiring.
- Insulation of terminal lugs.
- Bundling two or more wires together (e.g., inside fuel tanks).

5.1.3 When cutting heat shrinkable tubing to length, all cuts shall be clean, square and free of burrs to prevent splitting as a result of shrinking.

5.1.4 Before shrinking, ensure that the area over which the tubing is to be applied is clean and free of grease or oil. If necessary, solvent clean parts according to PPS 31.17 before assembling and shrinking the tubing in place.

5.1.5 Perform all shrinking using a suitable hot air gun (see paragraph 4.2.1).

5.1.6 Immediately after completion of shrinking, cease the application of heat to prevent over heating.

5.2 Installation Details

5.2.1 DSC 347 Part Mark/Identification Sleeves and Wrap Around Markers

5.2.1.1 Examine all areas to which DSC 347 part mark/identification sleeves or wrap around marker is to be applied and remove all burrs or sharp edges which could cause the sleeves or tape to puncture or split (see Figure 2).

5.2.1.2 Shrink the sleeve or wrap around marker using a suitable hot air gun.

5.2.1.3 When trimming sleeves, take care not to trim too close to the ends of the part mark or identification code.

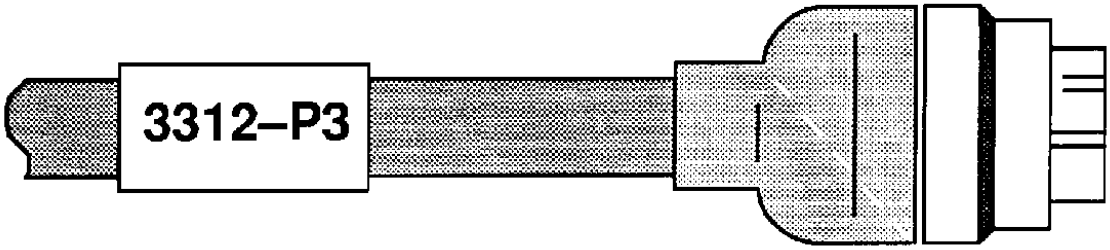


FIGURE 2 - IDENTIFICATION SLEEVE (TYPICAL)

5.2.2 Insulation

5.2.2.1 General

5.2.2.1.1 Typically insulation is required over areas if conductors or conductor contacts are exposed (e.g., terminal ends, splices and disconnects).

5.2.2.1.2 Select the specified tubing and cut it to length so as to provide a minimum 1/4" overlap on either side of the intended area.

5.2.2.1.3 Locate the insulation tubing centrally on the intended area making sure that the overlap is as required (see Figure 3).

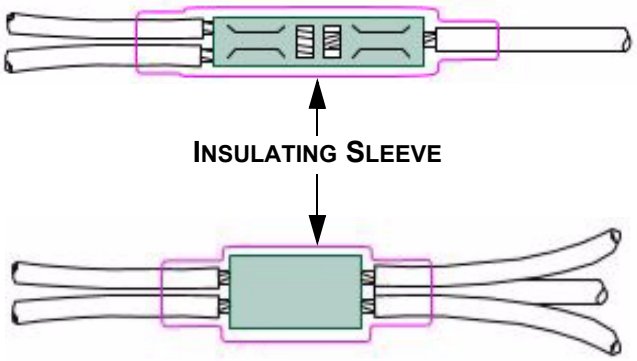


FIGURE 3 - INSULATION SLEEVE (TYPICAL)

5.2.2.2 Terminal Lugs

5.2.2.2.1 Select the specified tubing and cut approximately twice the length of the terminal barrel.

5.2.2.2.2 Locate insulating tubing on terminal lugs so as to cover the terminal barrel without interfering with the tongue of the lug (see Figure 4 and Figure 5).

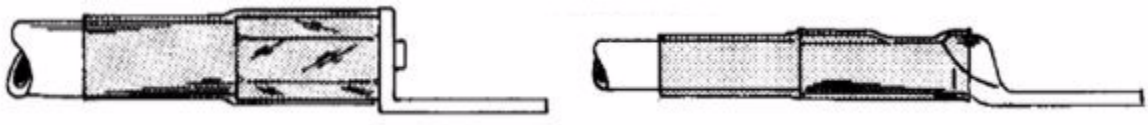
5.2.2.2.3 Shrink the tubing in place using a suitable hot air gun.

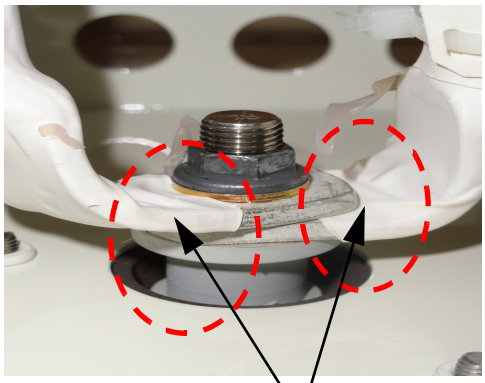
5.2.2.2.4 Begin shrinking the tubing in place by starting at the end of the sealing tube where the terminal is located.

5.2.2.2.5 For adhesive tubing, continue heating the adhesive ends until the adhesive melts and flows (approximately 2 to 3 minutes, depending on cable size). The adhesive will form a bead or fillet around the sleeve end. Do not remove any of the excess adhesive that flows from the sleeve. See Figure 5 for an example of an installed RT-555 adhesive tubing. The adhesive should not appear scorched or over-heated and there should be no excessive porosity in the adhesive.

5.2.2.2.6 The top of the lug shall be covered within 40 to 60% of its entire height and the bottom face shall be free of any tubing/insulation (see Figure 5).

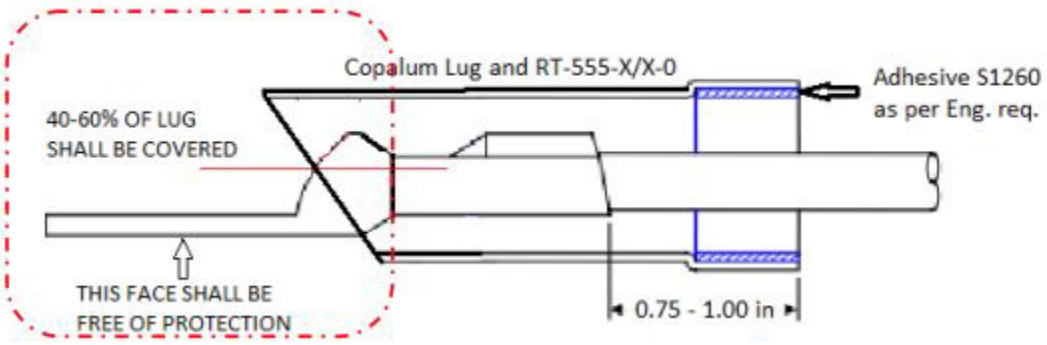
NOTE: INSULATING TUBING SHALL NOT EXTEND ONTO OR INTERFERE WITH TONGUE/BOTTOM FACE OF LUG





UNACCEPTABLE HEAT SHRINK UNDER LUG

FIGURE 4 - TERMINAL LUGS



PRE-SHRUNK CONDITION

INSTALLED RT-555 SEALING TUBING

FIGURE 5 - RT-555-X/X-0 TUBING ON COPALUM LUG

5.2.3 Bundling

5.2.3.1 Shrinkable tubing is used for bundling electrical wires if cable ties or glass fibre tape is not practicable (e.g., inside integral fuel tanks).

5.2.3.2 Arrange the wiring assembly as specified on the engineering drawing.

5.2.3.3 Select a suitable size of tubing and cut to length (approximately 1").

5.2.3.4 Slide the tubing onto the wire assembly and locate it where a cable tie would otherwise be placed.

5.2.3.5 Shrink the tubing in place using a suitable hot air gun (see Figure 6).

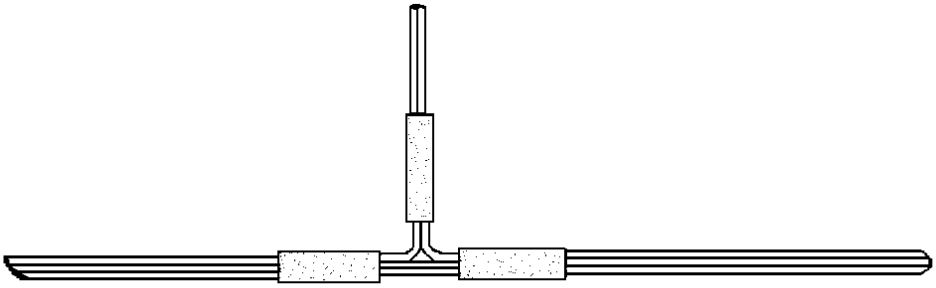


FIGURE 6 - BUNDLING WIRE CABLE (TYPICAL)

6 REQUIREMENTS

6.1 Shrunk sleeves and tubing shall be free of cracks, looseness, edge peeling or signs of over-heating.

6.2 Ensure installed sleeves and tubing are fully shrunk.

6.3 Sleeves shall be correctly positioned as specified on the engineering drawing or PPS, as applicable.

7 DHC/BA SAFETY PRECAUTIONS

7.1 The safety precautions specified herein are specific to DHC/BA to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is strongly recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

7.2 Observe standard plant safety precautions when performing the procedure specified herein.

7.3 Hot air guns develop extremely high temperatures at the screen nozzle. Exercise caution during handling to avoid burns. After the completion of operations, cool the heat gun by activating the switch to the cool position until the nozzle is cool enough to handle.

7.4 Refer to PPS 31.17 for the safety precautions for handling and using solvents.

8 PERSONNEL REQUIREMENTS

8.1 Personnel responsible for the installation of heat shrinkable tubing, tape and identification sleeves shall have a good working knowledge of the applicable procedure and requirements as specified herein and shall have exhibited their competency to their supervisor.