BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 10.28

PRODUCTION PROCESS STANDARD

ASSEMBLY OF WIRE THERMOCOUPLES

Issue 7
- This standard supersedes PPS 10.28, Issue 6.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Prepared By:	(Christie Chung)	October 2, 2015
	PPS Group	
Approved By:	(H.Y. Tran)	October 2, 2015
	Materials Technology	
	(*A. Assivero*, for D. Dawe)	October 20, 2015
	Quality	

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

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the assembly of wire thermocouples used to monitor the temperature of laminates and sandwich panels, fabricated according to PPS 10.35, PPS 10.43, PPS 10.48 or PPS 36.10 during the cure cycle.

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 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. do not supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

2 HAZARDOUS MATERIALS

2.1 Before receipt at Bombardier Toronto, all materials shall be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto 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 the Bombardier Toronto Environment, Health and Safety Department.

3 REFERENCES

3.1 ASTM E-220 - Thermocouples by Comparison Techniques, Calibration of.

3.2 DHMS M2.24 - Thermocouple Wire.

3.3 PPS 9.09 - Splicing Electrical Wires.

3.4 PPS 9.24 - Wire and Cable Stripping.

3.5 PPS 10.35 - Fabrication of 250°F Cure, Epoxy Resin Pre-Impregnated, Fibre Reinforced Composite Parts.

3.6 PPS 10.43 - Fabrication of 350°F Cure Epoxy Resin Pre-Impregnated, Fibre Reinforced Composite Parts.

3.7 PPS 10.48 - Fabrication of 280°F Cure, Phenolic Resin Pre-Impregnated, Fibre Reinforced Composite Parts.

3.8 PPS 13.26 - General Subcontractor Provisions.

3.9 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.10 PPS 31.17 - Solvent Usage.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Thermocouple wire to DHMS M2.24 (DSC 234-22 thermocouple wire). Produce sufficient detailed information for traceability of thermocouples from its original roll.

4.1.2 DSC 234-23 thermocouple plugs.

4.1.3 Splice connectors, M81824/1-1.

4.2 Equipment

4.2.1 Spot or resistance welding machine.

4.3 Facilities

4.3.1 This PPS has been categorized as a “Controlled Special Process” according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform the assembly of wire thermocouples used to monitor the temperature of laminates and sandwich panels, fabricated according to PPS 10.35, PPS 10.43, PPS 10.48 or PPS 36.10 during the cure cycle according to this PPS.

4.3.2 Bombardier subcontractors shall direct requests for approval to Bombardier Aerospace Supplier Quality Management. Bombardier Aerospace facilities shall direct requests for approval to the appropriate internal Quality Manager.

5 PROCEDURE

5.1 General

5.1.1 A thermocouple is a temperature sensing device. It is constructed of two dissimilar metals which generates a voltage as a function of temperature between a measuring and reference junction. The magnitude of the voltage is used as a measure of the temperature in question.

5.2 Assembly of Thermocouple

5.2.1 Except as noted in paragraph 5.2.2, prepare thermocouples using M81824/1-1 splice connectors as follows:

Step 1. Crimp a M81824/1-1 splice connector onto the measuring end of the thermocouple wire (see Figure 1) according to PPS 9.09.

Step 2. Install the appropriate thermocouple plug onto the reference end of the thermocouple wire (i.e., For DSC 234-22-1 thermocouple wire, install a DSC 234-23-1 thermocouple plug. For DSC 234-22-2 thermocouple wire, install a DSC 234-23-2 thermocouple plug).

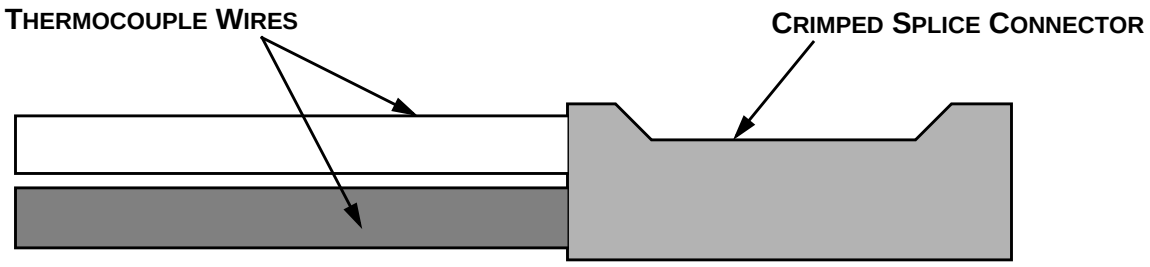

FIGURE 1 - CRIMPED THERMOCOUPLE ENDS

5.2.2 Alternatively, it is acceptable to assemble thermocouples by welding the measuring end as follows:

Step 1. Strip back the thermocouple wire ends 3/4" - 1" at the measuring end of the thermocouple wire according to PPS 9.24.

Step 2. Twist (no more than 2 turns, see Figure 2) the stripped thermocouple wire ends together at the measuring junction end of the thermocouple wire.

Step 3. Install the appropriate thermocouple plug onto the reference end of the thermocouple wire (i.e., For DSC 234-22-1 thermocouple wire, install a DSC 234-23-1 thermocouple plug. For DSC 234-22-2 thermocouple wire, install a DSC 234-23-2 thermocouple plug).

Step 4. Solvent wipe the twisted thermocouple end according to PPS 31.17.

Step 5. Spot or resistance weld the twisted thermocouple end.

FIGURE 2 - TWISTING OF THERMOCOUPLE ENDS

6 REQUIREMENTS

6.1 All thermocouples shall be checked for continuity using a suitable continuity check device (e.g. ohmmeter).

6.2 All thermocouples shall be checked for the correct polarity (i.e., the red thermocouple wire shall be connected to the negative terminal of the thermocouple plug and the white thermocouple wire shall be connected to the positive terminal of the thermocouple plug).

6.3 Verify acceptability of thermocouples and thermocouple wire against standards meeting the requirements of ASTM E220 or DHMS M2.24. Provided that traceability is maintained to a verified spool, it is acceptable to verify spools of thermocouple wire in place of verifying each individual thermocouple. To verify spools of thermocouple wire, verify one thermocouple from each end of the spool. There should be no more than 3000 feet of wire on any one spool.

7 SAFETY PRECAUTIONS

7.1 Safety precautions applicable to the materials and procedures specified herein shall be defined by the subcontractor performing the work for Bombardier Toronto.

8 PERSONNEL REQUIREMENTS

8.1 This PPS has been categorized as a “Controlled Special Process” according to PPS 13.39. Refer to PPS 13.39 for personnel requirements.