BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 1.33

PRODUCTION PROCESS STANDARD

Countersinking for Flush Head Fasteners

Issue 5
- This standard supersedes PPS 1.33, Issue 4.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for countersinking parts and assemblies for the installation of flush head type fasteners or nesting of dimpled assemblies into the countersink.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must 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.

2 Hazardous Materials

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

3 References

3.1 PPS 1.09 - Drilling and Reaming.

3.2 PPS 1.31 - Drill/Countersinking for Flush Head Fasteners.

3.3 PPS 1.32 - Set-Up and Operation of Spacematic Drillmotor Model 1600 and 6000.

3.4 PPS 1.37 - Set-Up and Operation of Spacematic & Q-Matic Drillmotors.

3.5 PPS 1.40 - Set-Up and Operation of Nut Plate Drillmotor.

3.6 PPS 1.41 - Set-Up and Operation of the Craco Automatic Drill Riveters.

3.7 PPS 1.43 - Set-Up and Operation of Drivmatic Drill/Riveters.

3.8 PPS 10.39 - Machining of Fibre Reinforced Composite Parts

3.9 PPS 13.26 - General Subcontractor Provisions.

4 Materials and Equipment

4.1 Materials

4.1.1 No materials specified.

4.2 Equipment

4.2.1 Micro-stop tools, cutters, pilots, adapters, etc. (e.g., TS 561.71.XX).

4.2.2 Countersink gauges (e.g., Trulok 100° or Brencor 100°).

5 Procedure

5.1 General

5.1.1 Unless otherwise specified, perform drilling of material preparatory to countersinking according to PPS 1.09. All holes must be drilled straight and normal to the surface of the work.

5.1.2 Unless otherwise specified, the countersink diameters specified in particular fastener PPS's are for reference only and the acceptability of flush head fastener installations is based upon the flushness requirements specified in the fastener PPS.

5.1.3 Except as noted below, countersink for the installation of flush head fasteners using only micro-stop countersink tools according to this standard.

- Refer to PPS 1.32 or PPS 1.37, as applicable, for drill/countersinking using Spacematic or Q-matic drillmotors.
- Refer to PPS 1.31 for drill/countersinking using micro-stop drill/countersinks.
- If using a Nutplate drillmotor, drill and countersink according to PPS 1.40.
- If using an automatic drill riveter, drill and countersink according to PPS 1.41 or PPS 1.43, as applicable.

5.2 Tooling

5.2.1 Use only micro-stop countersinks that produce countersinks concentric to the drilled hole and which do not cause chatter or tool marks.

5.2.2 Micro-stop countersinks, set-up and adjusted according to this standard, may be used in portable electric motors, air powered motors or stationary drill presses.

5.2.3 Select a countersink cutter with a diameter large enough for the work being done and an included angle of 100°, or where specified 130°. In most cases the required included angle for a countersink will be 100°, however certain special use fasteners utilize flush head fasteners with 130° heads (e.g. B0207001 and B0207002 Composi-Lok fasteners).

5.2.4 Use countersinks with pilots of the correct size to maintain concentricity with the drilled hole and prevent chatter marks.

5.2.5 When countersinking holes in fibre reinforced composite parts, it is recommended that a countersink cutter as specified in PPS 10.39 be used.

5.3 Set-Up and Adjustment of Micro Stop Countersinks

5.3.1 Micro-stop countersinks can be adjusted, as required, to either increase or decrease the size of the countersink as follows (see Figure 1).

Step 1. Back off the lock ring completely.

Step 2. Hold the footpiece and push the knurled adjusting sleeve up away from the footpiece so as to unlock it.

Step 3. Rotate the adjustment sleeve clockwise to increase and counter clockwise to decrease the diameter of the produced countersink. Each division of the adjustment sleeve will effect a change of approximately 0.0025" in diameter of the countersink.

Step 4. Release the adjustment sleeve and check that it is locked in position.

Step 5. When certain of the correct setting, thread the lock ring down against the adjustment sleeve to lock the setting (test countersinks can be made without the lock ring threaded down but once the correct setting is determined, lock the setting).

5.3.2 Set-up micro-stop countersink tools to prepare a particular size countersink as follows:

Step 1. Install the proper countersink cutter in the micro-stop. Ensure that the cutter pilot is of the correct size for the drilled hole.

Step 2. Chuck the micro-stop countersink tool into the drilling equipment.

Step 3. Using a test panel of the same material and gauge as the production part, and drilled with the same size pilot hole, countersink one hole according to section 5.4.

Step 4. Measure the test countersink with a countersink gauge according to section 5.5.

Step 5. Adjust the micro-stop, as required, to either increase or decrease the size of the countersink according to paragraph 5.3.1.

Step 6. Repeat Step 3 through Step 5 until the correct size countersink is obtained. This should be as close as possible to the midpoint of the specified range of countersink diameters for the relevant fastener.

Step 7. When the correct size is attained, perform another countersinking operation on the test panel and check for size according to section 5.5 to ensure repeatability.

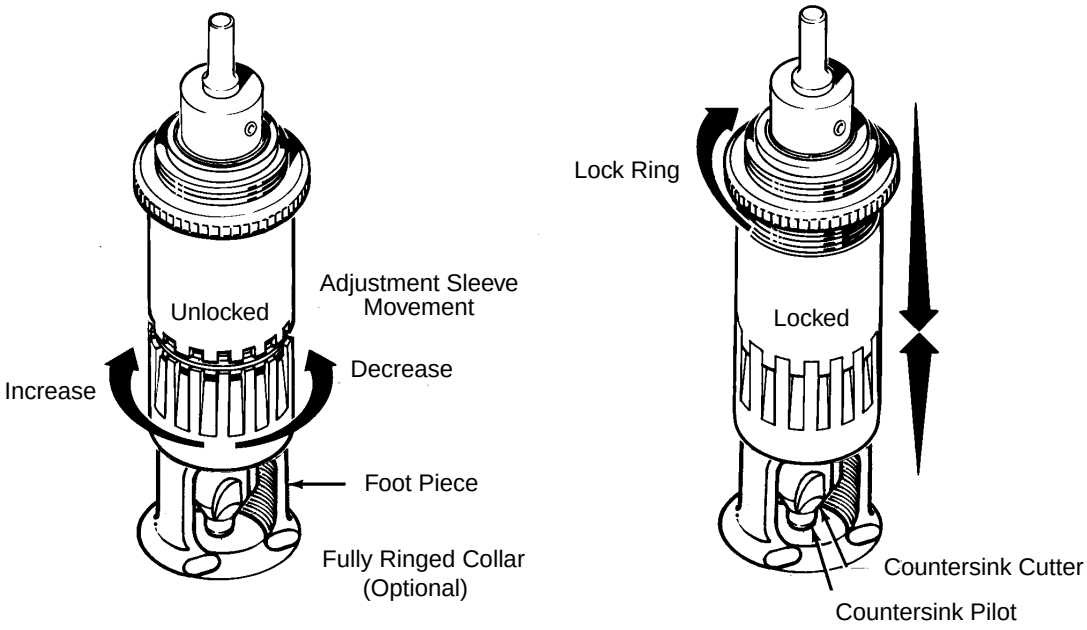

Figure 1 - Micro-Stop Countersink Cutter Assembly

5.4 Countersinking

5.4.1 Countersink as follows:

Step 1. If countersinking thin material, support the far side of the material to prevent enlarged or torn countersink holes.

Step 2. To prevent the adjusting sleeve of the micro-stop countersink tool from rotating, grip it by hand before starting the drill motor.

Step 3. Align the countersink pilot with the drilled hole and bring the foot piece into contact with the work.

Step 4. Maintain the micro-stop countersink tool square to the surface of the material and keep the foot plate flat on the surface during countersinking.

Step 5. Start the motor and depress the countersink cutter into the drilled hole by pushing on the drill motor to effect cutting. Do not apply excessive force on the tool (as would be evidenced by a high whining sound).

Step 6. When the cutter reaches the end of its stroke, withdraw it from the hole.

5.5 Use of Countersink Gauges

5.5.1 Ensure that the gauge is the same angle as the countersink and that its range includes the specified countersink diameter. Refer to Table 1 for sizes of Trulok gauges.

5.5.2 Use Trulock countersink gauges (see Figure 2) as follows:

Step 1. Reset the slide by pulling the knurled reset knob out to its limit before using the gauge.

Step 2. Press the conical head of the gauge squarely into the center of the countersink until the body of the gauge rests solidly on the surrounding surfaces.

Step 3. Remove the gauge. Take care not to jar or knock the gauge after measuring the countersink and before reading the scale.

Step 4. Countersink diameters are read in thousandths of an inch opposite the line on the slide. Each small division represents 0.005".

5.5.3 Check countersink gauges using a test block at least once before each shift during which the gauge is used. If the gauge reading is not in agreement with the test block, return the gauge to Metrology for a calibration check.

5.5.4 Use Brencor countersink check gauges (see Figure 3) according to the manufacturer's instructions.

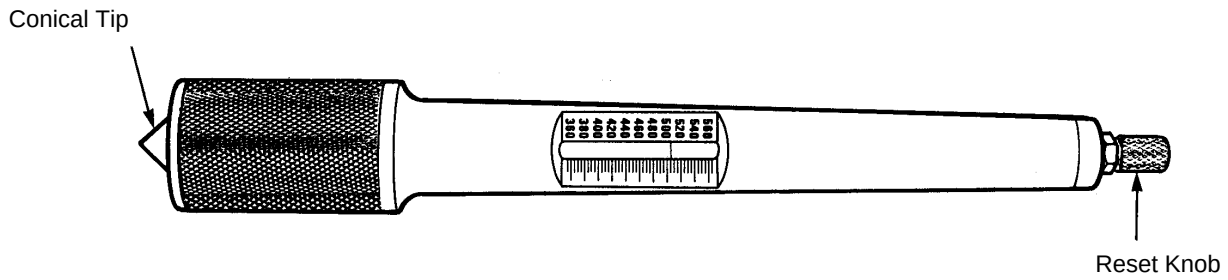

Figure 2 - Trulok Countersink Gauge

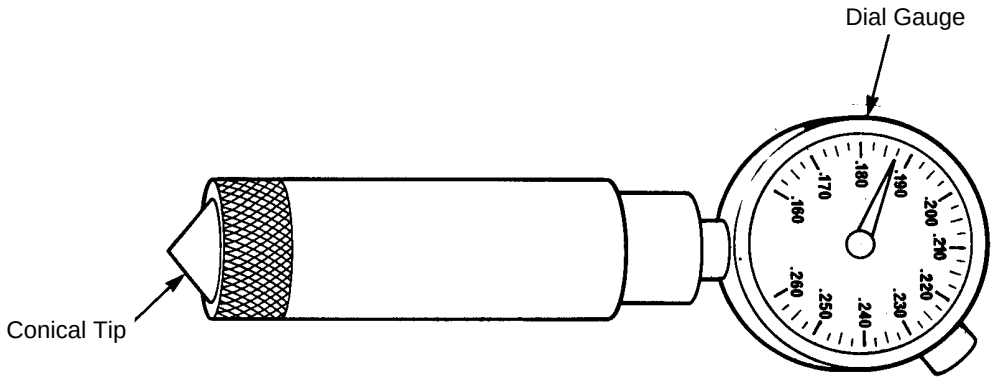

Figure 3 - Brencor Countersink Gauge

Table 1 - Trulok and Brencor Countersink Gauge Sizes

TRULOK AND BRENCOR GAUGE NUMBERS	LIMITS	COUNTERSINK ANGLE
100-1	0.160” - 0.360”	100°
100-2	0.360” - 0.560”	
100-3	0.560” - 0.780”	
100-4	0.780” - 1.000”	
100-4	1.000” - 1.335”	

6 Requirements

6.1 Countersinks must be free of burrs, scratches, or tool chatter marks.

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

7.2 Disconnect air lines from micro-stop countersink tools when changing the cutters or adjusting the depth of cut.

7.3 When countersinking, wear protective respiratory equipment according to PPS 13.13.

8 Personnel Requirements

8.1 Personnel responsible for countersinking for flush head fasteners must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Maintenance of Equipment

9.1 Use only sharp countersink cutters for countersinking. Re-sharpen or discard dull cutters, as necessary.

9.2 Ensure calibration of countersink gauges according to an established suitable schedule.