

# BOMBARDIER

Toronto (de Havilland)

**PROPRIETARY INFORMATION**

# PPS 1.37

**PRODUCTION PROCESS STANDARD**

## Set-Up and Operation of Portable Automatic Drillmotors

- Issue 13 - This standard supersedes PPS 1.37, Issue 12.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
  - Direct PPS related questions to [PPS.Group@aero.bombardier.com](mailto:PPS.Group@aero.bombardier.com) or (416) 375-4365.
  - This PPS is effective as of the distribution date.

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Production Process Standards (PPS)

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Quality

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## 1 Scope

- 1.1 This Production Process Standard (PPS) specifies the procedure and requirements for set-up, adjustment and operation of air-operated, hydraulically controlled, portable tools that automatically drill and countersink fastener holes.
- 1.2 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.
  - 1.2.1 Refer to [PPS 13.26](#) for the subcontractor provisions applicable to this PPS.
  - 1.2.2 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in 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 1.33](#) - Countersinking for Flush Head Fasteners.
- 3.2 [PPS 13.13](#) - Personal Protective Respiratory Equipment.
- 3.3 [PPS 13.26](#) - General Subcontractor Provisions.

## 4 Materials and Equipment

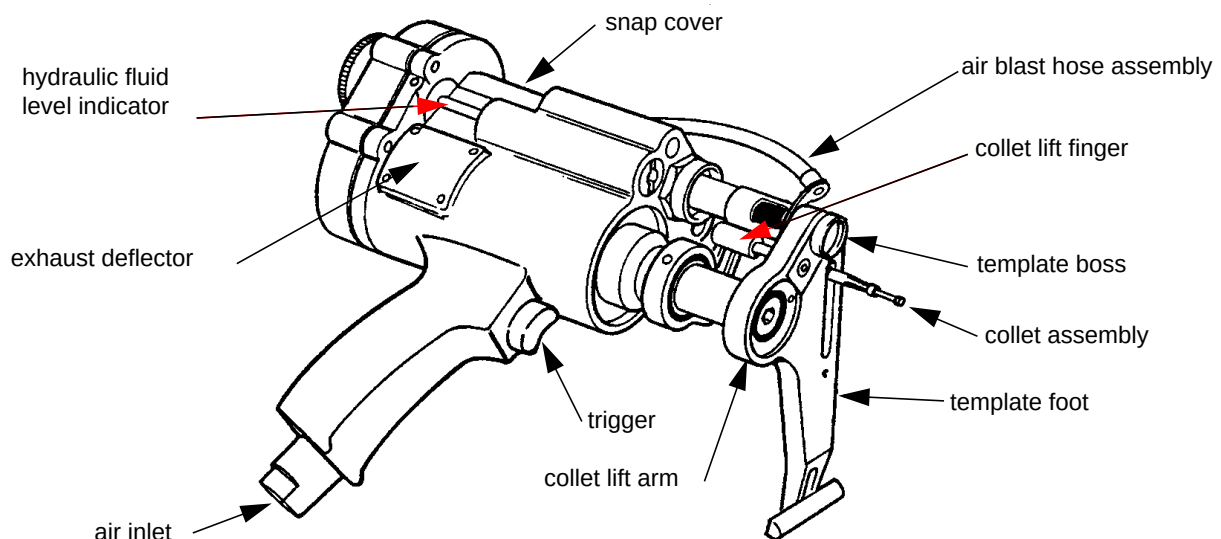
### 4.1 Materials

- 4.1.1 Drilling lubricant - Boelube (solid 70200 or liquid 70106), Relton A-9 or BAMS 569-001 Class C or D.

### 4.2 Equipment

- 4.2.1 Collet assemblies, drills and drill/countersinks (e.g., as specified in [Table 1](#) through [Table 3](#)).

- 4.2.2 Template bosses (e.g., see [Table 4](#) through [Table 6](#)).
- 4.2.3 Spacematic templates (e.g., TS.514.49.00).
- 4.2.4 Spacematic template fasteners (e.g., TS.514.49.11).
- 4.2.5 Drill template starter fixtures (e.g., see [Table 7](#)).
- 4.2.6 Wood block, 3/4" x 1 1/2" x 6" (for pressurizing Spacematic foot piston).
- 4.2.7 Go/No-Go plug gauges.
- 4.2.8 Air-operated, hydraulically controlled, portable tools that automatically drill and countersink fastener holes (hereafter referred to as automatic, portable drillmotors). Automatic, portable drillmotors used at Bombardier Toronto (de Havilland) include the following. Use of alternative automatic, portable drillmotors is acceptable provided all the hole requirements of the engineering drawing and fastener PPS are met.
  - Spacematic drillmotor Model 1000 (see [Figure 1](#))
  - Quackenbush Self-Colleting Model 962QB-5028
  - Quackenbush Q-matic drillmotor Model 15SC
  - Quackenbush Q-matic drillmotor Model 136SC
  - Hi Shear M1500 II
  - Doler Model P315



**Figure 1 - General Description of Spacematic Drillmotor**

## 5 Procedure

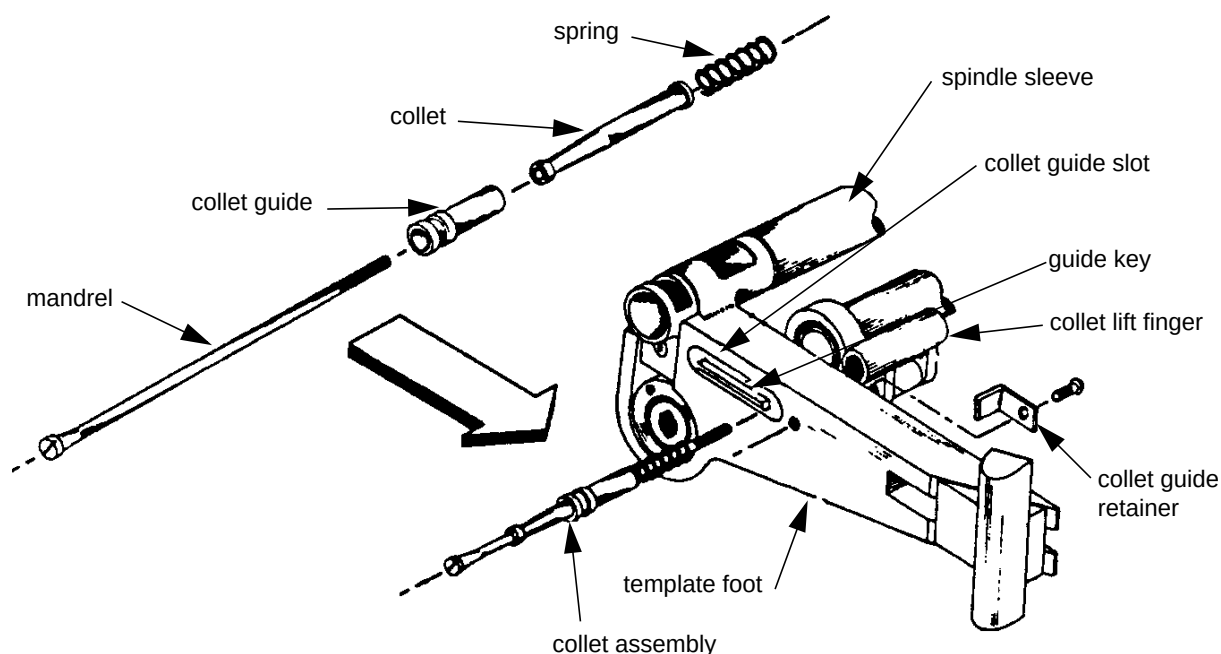
### 5.1 General

- 5.1.1 The Spacematic Model 1000 and Q-matic Model 136SC-118 drillmotors are capable of automatically drilling and countersinking fastener holes through material up to 1.000" thick. The Q-matic Model 15SC-225 drillmotor is capable of automatically drilling and countersinking fastener holes through material up to 2.000" thick.
- 5.1.2 The Spacematic Model 1000 drillmotor replaces Models 62 and 75. It uses the same drills and collet assemblies as the Models 62 and 75, but uses a different template foot and collet guide.
- 5.1.3 Automatic, portable drillmotors must be set-up and adjusted with a specific combination of collet, mandrel, template foot, template boss and drill or drill/countersink, as applicable, for installation of each type and size of fastener in a specific material grip thickness range.
- 5.1.4 It is acceptable to use Spacematic templates and template fasteners when drilling fastener holes with other drillmotors, as applicable.
- 5.1.5 It is acceptable to use alternative drills, drill/countersinks, reamers or double margin drills to the TS tooling specified in this PPS provided that all the hole requirements of the engineering drawing and fastener PPS are met.
- 5.1.6 It is recommended that each automatic, portable drillmotor be clearly marked as to the specific cutter diameter, cutter type (drill or drill/countersink) and the material grip thickness range for which it has been set-up and that only the size of cutter that is marked on the drillmotor be used with it.
- 5.1.7 Keep hose lines as short as practical. Avoid having many lines connected to the same outlet. Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors must receive 90 psig measured at the tool inlet with the motor running for them to work effectively. If necessary, connect the air line to a different outlet. It is recommended that hose lines and fittings be at least 3/8" in diameter.

### 5.2 Set-Up of the Drillmotor

- 5.2.1 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, install and adjust the collet assembly as follows:
  - Step 1. Select the collet, mandrel, spring and collet guide from [Table 1](#), [Table 2](#) or [Table 3](#), as applicable, for the drill and drill size to be used (as specified by the fastener PPS) and the thickness of the assembly to be drilled.
  - Step 2. Assemble the collet, mandrel, collet guide and spring as shown in [Figure 2](#).

- Step 3. Insert the collet assembly through the collet guide slot in the template foot and into the collet lift finger.
- Step 4. Engage the collet guide in the template foot and slide the collet assembly toward the spindle. Ensure that the collet guide slides freely in the guide slot.
- Step 5. Thread the mandrel into the collet lift finger until the threads of the mandrel are just visible at the rear of the lift finger.
- Step 6. Install the collet guide retainer in the template foot.
- Step 7. Connect an air line to the drillmotor and adjust the mandrel so that the small end of the tapered portion of the mandrel is just flush with the end of the collet (i.e., the collet has not been expanded).

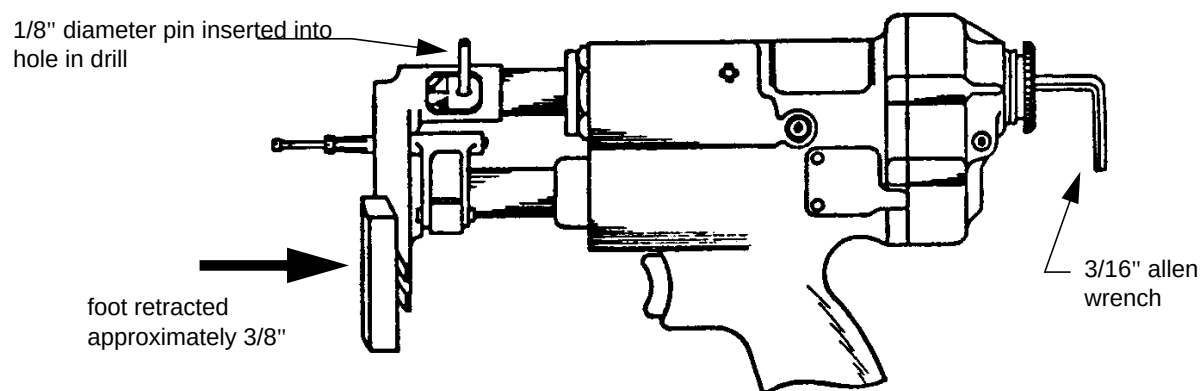


**Figure 2 - Installation of Collet Assembly**

- 5.2.1.1 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), install and adjust the appropriate collet assembly according to the drillmotor manufacturer's instructions.

5.2.2 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, install drills and drill/countersinks as follows:

- Step 1. Ensure that the air line is disconnected.
- Step 2. Connect the drillmotor air line to an air outlet and press the trigger to retract the template foot approximately  $\frac{3}{8}$ ", disconnect the air line while holding down the trigger so that the template foot remains retracted to expose the wrenching hole in the drill.
- Step 3. Thread the drill or drill/countersink specified by the applicable fastener PPS fully onto the spindle by hand, insert a  $\frac{1}{8}$ " diameter pin into the wrenching hole in the drill and tighten the drill by rotating the spindle using a  $\frac{3}{16}$ " hex wrench as shown in Figure 3. If binding of the drill on the template boss occurs, loosen or remove the template boss to facilitate installation of the drill. Re-install or re-tighten the boss after tightening the drill.



**Figure 3 - Installation of Drills and Drill/Countersinks**

5.2.2.1 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), install and adjust the appropriate drills or drill/countersinks according to the equipment manufacturer's instructions.

5.2.3 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, install the template boss as follows:

- Step 1. Select the template boss from Table 4 through Table 6 for the corresponding drill template thickness and hole diameter.
- Step 2. Assemble the template boss onto the template foot and secure it in place by means of the template boss retaining screw (see Figure 4).



- 5.2.3.1 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), install the appropriate template boss according to the equipment manufacturer's instructions.

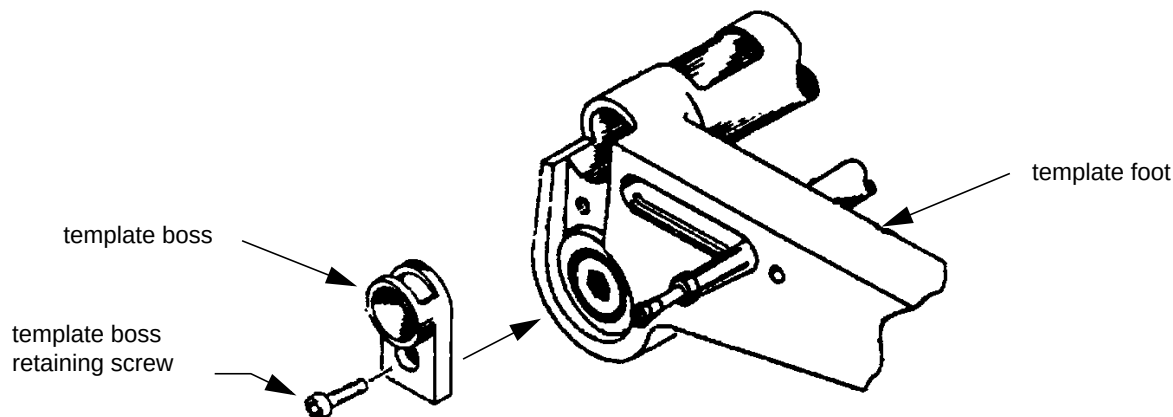


Figure 4 - Installation of Template Boss

Table 1 - Spacematic Collet Assembly Selection

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                              | MATERIAL STACK-UP | SPACEMATIC COLLET ASSEMBLY PART NUMBERS (see Notes) |                   |                            |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|-------------------|----------------------------|-------------------------|
|                                                                                                                                                                                                                                                                           |                   | Collet                                              | Collet Grip Range | Mandrel                    | Collet Guide            |
| TS.514.41.11 DRILLS                                                                                                                                                                                                                                                       |                   |                                                     |                   |                            |                         |
| TS.514.41.11<br>MK 1 (0.128")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050175 or<br>1000-1250-23                          | 0.00" - 0.35"     | 1190556 or<br>2000-1250-05 | 5430008 or<br>5200-1250 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050187 or<br>1000-1250-40                          | 0.23" - 0.61"     | 1053036 or<br>2000-1250-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1050199 or<br>1000-1250-63                          | 0.48" - 0.86"     | 1053048 or<br>2000-1250-40 |                         |
| TS.514.41.11<br>MK 2 (0.161")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050630 or<br>1000-1614-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430082 or<br>5200-1614 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050643 or<br>1000-1614-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1050655 or<br>1000-1614-63                          | 0.48" - 0.86"     | 1053255 or<br>2000-1562-40 |                         |
| TS.514.41.11<br>MK 4 (0.171")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050783 or<br>1000-1719-23                          | 0.00" - 0.35"     | 1190593 or<br>2000-1719-05 | 5430100 or<br>5200-1719 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050795 or<br>1000-1719-40                          | 0.23" - 0.61"     | 1053370 or<br>2000-1719-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1050801 or<br>1000-1719-63                          | 0.48" - 0.86"     | 1053383 or<br>2000-1719-40 |                         |
| Notes: 1. Use return spring 1190453.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.100" template boss (subtract 0.050" from both minimum and maximum values if using a 0.150" template boss). |                   |                                                     |                   |                            |                         |

**Table 1 - Spacematic Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                              | MATERIAL STACK-UP | SPACEMATIC COLLET ASSEMBLY PART NUMBERS (see Notes) |                   |                            |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|-------------------|----------------------------|-------------------------|
|                                                                                                                                                                                                                                                                           |                   | Collet                                              | Collet Grip Range | Mandrel                    | Collet Guide            |
| TS.514.41.11 DRILLS                                                                                                                                                                                                                                                       |                   |                                                     |                   |                            |                         |
| TS.514.41.11<br>MK 5 (0.201")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1051222 or<br>1000-1979-23                          | 0.00" - 0.35"     | 1190623 or<br>2000-2031-05 | 5430161 or<br>5200-1979 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051234 or<br>1000-1979-40                          | 0.23" - 0.61"     | 1053620 or<br>2000-2031-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1051246 or<br>1000-1979-63                          | 0.48" - 0.86"     | 1053632 or<br>2000-2031-40 |                         |
| TS.514.41.11<br>MK 6 (0.189")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1051015 or<br>1000-1875-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.41.11<br>MK 7 (0.1865")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1051015 or<br>1000-1875-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.41.11<br>MK 8 (0.2465")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1051763 or<br>1000-2448-23                          | 0.00" - 0.35"     | 5430707 or<br>2000-2500-05 | 5430252 or<br>5200-2448 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051775 or<br>1000-2448-40                          | 0.23" - 0.61"     | 1053929 or<br>2000-2500-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1051787 or<br>1000-2448-63                          | 0.48" - 0.86"     | 1053930 or<br>2000-2500-40 |                         |
| TS.514.41.11<br>MK 9 (0.159")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050540 or<br>1000-1562-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430070 or<br>5200-1562 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050552 or<br>1000-1562-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1050564 or<br>1000-1562-63                          | 0.48" - 0.86"     | 1053255 or<br>2000-1562-40 |                         |
| TS.514.41.11<br>MK 10 (0.253")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1051890 or<br>1000-2500-23                          | 0.00" - 0.35"     | 5430707 or<br>2000-2500-05 | 5430264 or<br>5200-2500 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051908 or<br>1000-2500-40                          | 0.23" - 0.61"     | 1053929 or<br>2000-2500-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1051920 or<br>1000-2500-63                          | 0.48" - 0.86"     | 1053930 or<br>2000-2500-40 |                         |
| Notes: 1. Use return spring 1190453.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.100" template boss (subtract 0.050" from both minimum and maximum values if using a 0.150" template boss). |                   |                                                     |                   |                            |                         |

**Table 1 - Spacematic Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                              | MATERIAL STACK-UP | SPACEMATIC COLLET ASSEMBLY PART NUMBERS (see Notes) |                   |                            |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|-------------------|----------------------------|-------------------------|
|                                                                                                                                                                                                                                                                           |                   | Collet                                              | Collet Grip Range | Mandrel                    | Collet Guide            |
| TS.514.41.11 DRILLS                                                                                                                                                                                                                                                       |                   |                                                     |                   |                            |                         |
| TS.514.41.11<br>MK 11 (0.2455")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1051763 or<br>1000-2448-23                          | 0.00" - 0.35"     | 5430707 or<br>2000-2500-05 | 5430252 or<br>5200-2448 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051775 or<br>1000-2448-40                          | 0.23" - 0.61"     | 1053929 or<br>2000-2500-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1051787 or<br>1000-2448-63                          | 0.48" - 0.86"     | 1053930 or<br>2000-2500-40 |                         |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                           |                   |                                                     |                   |                            |                         |
| TS.514.43.11<br>MK 1 (0.1850")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050886 or<br>1000-1823-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430124 or<br>5200-1823 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050898 or<br>1000-1823-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1823-23 |                         |
| TS.514.43.11<br>MK 2 (0.128")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050175 or<br>1000-1250-23                          | 0.00" - 0.35"     | 1190556 or<br>2000-1250-05 | 5430008 or<br>5200-1250 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050187 or<br>1000-1250-40                          | 0.23" - 0.61"     | 1053036 or<br>2000-1250-23 |                         |
| TS.514.43.11<br>MK 3 (0.159")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050540 or<br>1000-1562-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430070 or<br>5200-1562 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050552 or<br>1000-1562-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
| TS.514.43.11<br>MK 4 (0.161")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050630 or<br>1000-1614-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430082 or<br>5200-1614 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050643 or<br>1000-1614-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
| TS.514.43.11<br>MK 5 (0.189")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
| TS.514.43.11<br>MK 7 (0.190")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
| TS.514.43.11<br>MK 8 (0.171")                                                                                                                                                                                                                                             | 0.00" - 0.35"     | 1050783 or<br>1000-1719-23                          | 0.00" - 0.35"     | 1190593 or<br>2000-1719-05 | 5430100 or<br>5200-1719 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050795 or<br>1000-1719-40                          | 0.23" - 0.61"     | 1053370 or<br>2000-1719-23 |                         |
| Notes: 1. Use return spring 1190453.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.100" template boss (subtract 0.050" from both minimum and maximum values if using a 0.150" template boss). |                   |                                                     |                   |                            |                         |

**Table 1 - Spacematic Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                              | MATERIAL STACK-UP | SPACEMATIC COLLET ASSEMBLY PART NUMBERS (see Notes) |                   |                            |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|-------------------|----------------------------|-------------------------|
|                                                                                                                                                                                                                                                                           |                   | Collet                                              | Collet Grip Range | Mandrel                    | Collet Guide            |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                           |                   |                                                     |                   |                            |                         |
| TS.514.43.11<br>MK 9 (0.1850")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050886 or<br>1000-1823-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430124 or<br>5200-1823 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050898 or<br>1000-1823-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.68"     | 1050904 or<br>1000-1823-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.43.11<br>MK 10 (0.201")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1051222 or<br>1000-1979-23                          | 0.00" - 0.35"     | 1190623 or<br>2000-2031-05 | 5430161 or<br>5200-1979 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1051234 or<br>1000-1979-40                          | 0.23" - 0.61"     | 1053620 or<br>2000-2031-23 |                         |
| TS.514.43.11<br>MK 11 (0.141")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050357 or<br>1000-1406-23                          | 0.00" - 0.35"     | 1190568 or<br>2000-1406-05 | 5430045 or<br>5200-1406 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050369 or<br>1000-1406-40                          | 0.23" - 0.61"     | 1053140 or<br>2000-1406-23 |                         |
| TS.514.43.11<br>MK 12 (0.1865")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
| TS.514.43.11<br>MK 13 (0.1865")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.48" - 0.86"     | 1051015 or<br>1000-1875-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.43.11<br>MK 14 (0.246")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1051763 or<br>1000-2448-23                          | 0.00" - 0.35"     | 5430707 or<br>2000-2500-05 | 5430252 or<br>5200-2448 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051775 or<br>1000-2448-40                          | 0.23" - 0.61"     | 1053929 or<br>2000-2500-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.76"     | 1051787 or<br>1000-2448-63                          | 0.48" - 0.86"     | 1053930 or<br>2000-2500-40 |                         |
| TS.514.43.11<br>MK 15 (0.128")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050175 or<br>1000-1250-23                          | 0.00" - 0.35"     | 1190556 or<br>2000-1250-05 | 5430008 or<br>5200-1250 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050187 or<br>1000-1250-40                          | 0.23" - 0.61"     | 1053036 or<br>2000-1250-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1050199 or<br>1000-1250-63                          | 0.48" - 0.86"     | 1053048 or<br>2000-1250-40 |                         |
| Notes: 1. Use return spring 1190453.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.100" template boss (subtract 0.050" from both minimum and maximum values if using a 0.150" template boss). |                   |                                                     |                   |                            |                         |

**Table 1 - Spacematic Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                              | MATERIAL STACK-UP | SPACEMATIC COLLET ASSEMBLY PART NUMBERS (see Notes) |                   |                            |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|-------------------|----------------------------|-------------------------|
|                                                                                                                                                                                                                                                                           |                   | Collet                                              | Collet Grip Range | Mandrel                    | Collet Guide            |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                           |                   |                                                     |                   |                            |                         |
| TS.514.43.11<br>MK 16 (0.159")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050540 or<br>1000-1562-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430070 or<br>5200-1562 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050552 or<br>1000-1562-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1050564 or<br>1000-1562-63                          | 0.48" - 0.86"     | 1053255 or<br>2000-1562-40 |                         |
| TS.514.43.11<br>MK 17 (0.190")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1051015 or<br>1000-1875-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.43.11<br>MK 18 (0.161")                                                                                                                                                                                                                                            | 0.00" - 0.35"     | 1050630 or<br>1000-1614-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430082 or<br>5200-1614 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050643 or<br>1000-1614-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1050655 or<br>1000-1614-63                          | 0.48" - 0.86"     | 1053255 or<br>2000-1562-40 |                         |
| TS.514.43.11<br>MK 19 (0.1865")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1051015 or<br>1000-1875-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.43.11<br>MK 20 (0.1890")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050990 or<br>1000-1875-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430136 or<br>5200-1875 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051003 or<br>1000-1875-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1051015 or<br>1000-1875-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.43.11<br>MK 21 (0.2460")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1051763 or<br>1000-2448-23                          | 0.00" - 0.35"     | 5430707 or<br>2000-2500-05 | 5430252 or<br>5200-2448 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051775 or<br>1000-2448-40                          | 0.23" - 0.61"     | 1053929 or<br>2000-2500-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1051787 or<br>1000-2448-63                          | 0.48" - 0.86"     | 1053930 or<br>2000-2500-40 |                         |
| Notes: 1. Use return spring 1190453.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.100" template boss (subtract 0.050" from both minimum and maximum values if using a 0.150" template boss). |                   |                                                     |                   |                            |                         |

**Table 1 - Spacematic Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                              | MATERIAL STACK-UP | SPACEMATIC COLLET ASSEMBLY PART NUMBERS (see Notes) |                   |                            |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|-------------------|----------------------------|-------------------------|
|                                                                                                                                                                                                                                                                           |                   | Collet                                              | Collet Grip Range | Mandrel                    | Collet Guide            |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                           |                   |                                                     |                   |                            |                         |
| TS.514.43.11<br>MK 22 (0.1860")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050886 or<br>1000-1823-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430124 or<br>5200-1823 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050898 or<br>1000-1823-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1050904 or<br>1000-1823-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.43.11<br>MK 23 (0.1605")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050630 or<br>1000-1614-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430082 or<br>5200-1614 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050643 or<br>1000-1614-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
| TS.514.43.11<br>MK 24 (0.1605")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050630 or<br>1000-1614-23                          | 0.00" - 0.35"     | 1190581 or<br>2000-1562-05 | 5430082 or<br>5200-1614 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050643 or<br>1000-1614-40                          | 0.23" - 0.61"     | 1053243 or<br>2000-1562-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1050655 or<br>1000-1614-63                          | 0.48" - 0.86"     | 1053255 or<br>2000-1562-40 |                         |
| TS.514.43.11<br>MK 25 (0.1855")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050886 or<br>1000-1823-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430124 or<br>5200-1823 |
|                                                                                                                                                                                                                                                                           | 0.36" - 0.46"     | 1050898 or<br>1000-1823-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
| TS.514.43.11<br>MK 26 (0.1855")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1050886 or<br>1000-1823-23                          | 0.00" - 0.35"     | 1190611 or<br>2000-1875-05 | 5430124 or<br>5200-1823 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1050898 or<br>1000-1823-40                          | 0.23" - 0.61"     | 1053462 or<br>2000-1875-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1050904 or<br>1000-1823-63                          | 0.48" - 0.86"     | 1053474 or<br>2000-1875-40 |                         |
| TS.514.43.11<br>MK 28 (0.2455")                                                                                                                                                                                                                                           | 0.00" - 0.35"     | 1051763 or<br>1000-2448-23                          | 0.00" - 0.35"     | 5430707 or<br>2000-2500-05 | 5430252 or<br>5200-2448 |
|                                                                                                                                                                                                                                                                           | 0.23" - 0.61"     | 1051775 or<br>1000-2448-40                          | 0.23" - 0.61"     | 1053929 or<br>2000-2500-23 |                         |
|                                                                                                                                                                                                                                                                           | 0.62" - 0.71"     | 1051787 or<br>1000-2448-63                          | 0.48" - 0.86"     | 1053930 or<br>2000-2500-40 |                         |
| Notes: 1. Use return spring 1190453.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.100" template boss (subtract 0.050" from both minimum and maximum values if using a 0.150" template boss). |                   |                                                     |                   |                            |                         |

Table 2 - Q-Matic 136SC-118 Collet Assembly Selection

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                                                | MATERIAL STACK-UP | Q-MATIC 136SC-118 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                                             |                   | Collet                                         | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.41.11 DRILLS                                                                                                                                                                                                                                                                         |                   |                                                |                   |          |              |
| TS.514.41.11<br>MK 1 (0.128")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 623634-3                                       | 0.00" - 0.37"     | 629024   | 623540-2     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623344-9                                       | 0.18" - 0.62"     | 622604-7 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 629028                                         | 0.43" - 0.87"     | 623345-6 |              |
| TS.514.41.11<br>MK 2 (0.161")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622837-3                                       | 0.00" - 0.37"     | 624275-4 | 623547-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622601-3                                       | 0.18" - 0.62"     | 622248-3 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 622814-2                                       | 0.43" - 0.87"     | 622602-1 |              |
| TS.514.41.11<br>MK 4 (0.171")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 624129-3                                       | 0.00" - 0.37"     | 629025   | 623549-3     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623759-8                                       | 0.18" - 0.62"     | 622639-3 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 629029                                         | 0.43" - 0.87"     | 622553-6 |              |
| TS.514.41.11<br>MK 5 (0.201")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622117-0                                       | 0.00" - 0.37"     | 629026   | 623554-3     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 624654-0                                       | 0.18" - 0.62"     | 622118-8 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 624813-2                                       | 0.43" - 0.87"     | 623922-2 |              |
| TS.514.41.11<br>MK 6 (0.189")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 622818-3                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.41.11<br>MK 7 (0.1865")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 622818-3                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.41.11<br>MK 8 (0.2465")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 623472-8                                       | 0.00" - 0.37"     | 625004-1 | 623563-4     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623743-2                                       | 0.18" - 0.62"     | 622230-1 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 622820-9                                       | 0.43" - 0.87"     | 622231-9 |              |
| TS.514.41.11<br>MK 9 (0.159")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622247-5                                       | 0.00" - 0.37"     | 624275-4 | 623546-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623692-1                                       | 0.18" - 0.62"     | 622248-3 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 622812-6                                       | 0.43" - 0.87"     | 622602-1 |              |
| TS.514.41.11<br>MK 10 (0.253")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 622224-4                                       | 0.00" - 0.37"     | 625004-1 | 623564-2     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622225-0                                       | 0.18" - 0.62"     | 622230-1 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 623642-6                                       | 0.43" - 0.87"     | 622231-9 |              |
| TS.514.41.11<br>MK 11 (0.2455")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 623472-8                                       | 0.00" - 0.37"     | 625004-1 | 623563-4     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623743-2                                       | 0.18" - 0.62"     | 622230-1 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 622820-9                                       | 0.43" - 0.87"     | 622231-9 |              |
| Notes: 1. Use return spring 623793-7.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum (if greater than 0.00") and maximum values if using a 0.100" template boss). |                   |                                                |                   |          |              |

Table 2 - Q-Matic 136SC-118 Collet Assembly Selection

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                                                | MATERIAL STACK-UP | Q-MATIC 136SC-118 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                                             |                   | Collet                                         | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                                             |                   |                                                |                   |          |              |
| TS.514.43.11<br>MK 1 (0.1850")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 623689-7                                       | 0.00" - 0.37"     | 624274-7 | 623551-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 622676-5                                       | 0.18" - 0.62"     | 622226-9 |              |
| TS.514.43.11<br>MK 2 (0.128")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 623634-3                                       | 0.00" - 0.37"     | 629024   | 623540-2     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 623344-9                                       | 0.18" - 0.62"     | 622604-7 |              |
| TS.514.43.11<br>MK 3 (0.159")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622247-5                                       | 0.00" - 0.37"     | 624275-4 | 623546-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 623692-1                                       | 0.18" - 0.62"     | 622248-3 |              |
| TS.514.43.11<br>MK 4 (0.161")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622837-3                                       | 0.00" - 0.37"     | 624275-4 | 623547-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 622601-3                                       | 0.18" - 0.62"     | 622248-3 |              |
| TS.514.43.11<br>MK 5 (0.189")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
| TS.514.43.11<br>MK 7 (0.190")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
| TS.514.43.11<br>MK 8 (0.171")                                                                                                                                                                                                                                                               | 0.00" - 0.37"     | 624129-3                                       | 0.00" - 0.37"     | 629025   | 623549-3     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 623759-8                                       | 0.18" - 0.62"     | 622639-3 |              |
| TS.514.43.11<br>MK 9 (0.1850")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 623689-7                                       | 0.00" - 0.37"     | 624274-7 | 623551-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622676-5                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.68"     | 622816-7                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.43.11<br>MK 10 (0.201")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 622117-0                                       | 0.00" - 0.37"     | 629026   | 623554-3     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 624654-0                                       | 0.18" - 0.62"     | 622118-8 |              |
| TS.514.43.11<br>MK 11 (0.141")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 623166-6                                       | 0.00" - 0.37"     | 629047   | 623543-6     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 629027                                         | 0.18" - 0.62"     | 622510-6 |              |
| TS.514.43.11<br>MK 12 (0.1865")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
| TS.514.43.11<br>MK 13 (0.1865")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.87"     | 622818-3                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.43.11<br>MK 14 (0.246")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 623472-8                                       | 0.00" - 0.37"     | 625004-1 | 623563-4     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623743-2                                       | 0.18" - 0.62"     | 622230-1 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.76"     | 622820-9                                       | 0.43" - 0.87"     | 622231-9 |              |
| Notes: 1. Use return spring 623793-7.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum (if greater than 0.00") and maximum values if using a 0.100" template boss). |                   |                                                |                   |          |              |



Table 2 - Q-Matic 136SC-118 Collet Assembly Selection

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                                                | MATERIAL STACK-UP | Q-MATIC 136SC-118 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                                             |                   | Collet                                         | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                                             |                   |                                                |                   |          |              |
| TS.514.43.11<br>MK 15 (0.128")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 623634-3                                       | 0.00" - 0.37"     | 629024   | 623540-2     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623344-9                                       | 0.18" - 0.62"     | 622604-7 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 629028                                         | 0.43" - 0.87"     | 623345-6 |              |
| TS.514.43.11<br>MK 16 (0.159")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 622247-5                                       | 0.00" - 0.37"     | 624275-4 | 623546-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623692-1                                       | 0.18" - 0.62"     | 622248-3 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622812-6                                       | 0.43" - 0.87"     | 622602-1 |              |
| TS.514.43.11<br>MK 17 (0.190")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622818-3                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.43.11<br>MK 18 (0.161")                                                                                                                                                                                                                                                              | 0.00" - 0.37"     | 622837-3                                       | 0.00" - 0.37"     | 624275-4 | 623547-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622601-3                                       | 0.18" - 0.62"     | 622248-3 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622814-2                                       | 0.43" - 0.87"     | 622602-1 |              |
| TS.514.43.11<br>MK 19 (0.1865")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622818-3                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.43.11<br>MK 20 (0.1890")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 622222-8                                       | 0.00" - 0.37"     | 624274-7 | 623552-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622223-6                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622818-3                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.43.11<br>MK 21 (0.2460")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 623472-8                                       | 0.00" - 0.37"     | 625004-1 | 623563-4     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 623743-2                                       | 0.18" - 0.62"     | 622230-1 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622820-9                                       | 0.43" - 0.87"     | 622231-9 |              |
| TS.514.43.11<br>MK 22 (0.1860")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 623689-7                                       | 0.00" - 0.37"     | 624274-7 | 623551-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622676-5                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622816-7                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.43.11<br>MK 23 (0.1605")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 622837-3                                       | 0.00" - 0.37"     | 624275-4 | 623547-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 622601-3                                       | 0.18" - 0.62"     | 622248-3 |              |
| TS.514.43.11<br>MK 24 (0.1605")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 622837-3                                       | 0.00" - 0.37"     | 624275-4 | 623547-7     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"     | 622601-3                                       | 0.18" - 0.62"     | 622248-3 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"     | 622814-2                                       | 0.43" - 0.87"     | 622602-1 |              |
| TS.514.43.11<br>MK 25 (0.1855")                                                                                                                                                                                                                                                             | 0.00" - 0.37"     | 623689-7                                       | 0.00" - 0.37"     | 624274-7 | 623551-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.46"     | 622676-5                                       | 0.18" - 0.62"     | 622226-9 |              |
| Notes: 1. Use return spring 623793-7.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum (if greater than 0.00") and maximum values if using a 0.100" template boss). |                   |                                                |                   |          |              |

**Table 2 - Q-Matic 136SC-118 Collet Assembly Selection**

| DRILL OR DRILL/CSK<br>SPECIFIED                                                                                                                                                                                                                                                             | MATERIAL<br>STACK-UP | Q-MATIC 136SC-118 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                                             |                      | Collet                                         | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.43.11 DRILL/COUNTERSINKSS                                                                                                                                                                                                                                                            |                      |                                                |                   |          |              |
| TS.514.43.11<br>MK 26 (0.1855")                                                                                                                                                                                                                                                             | 0.00" - 0.37"        | 623689-7                                       | 0.00" - 0.37"     | 624274-7 | 623551-9     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"        | 622676-5                                       | 0.18" - 0.62"     | 622226-9 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"        | 622816-7                                       | 0.43" - 0.87"     | 622232-7 |              |
| TS.514.43.11<br>MK 28 (0.2455")                                                                                                                                                                                                                                                             | 0.00" - 0.37"        | 623472-8                                       | 0.00" - 0.37"     | 625004-1 | 623563-4     |
|                                                                                                                                                                                                                                                                                             | 0.38" - 0.62"        | 623743-2                                       | 0.18" - 0.62"     | 622230-1 |              |
|                                                                                                                                                                                                                                                                                             | 0.63" - 0.71"        | 622820-9                                       | 0.43" - 0.87"     | 622231-9 |              |
| Notes: 1. Use return spring 623793-7.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum (if greater than 0.00") and maximum values if using a 0.100" template boss). |                      |                                                |                   |          |              |

**Table 3 - Q-Matic 15SC-225 Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                      | MATERIAL STACK-UP | Q-MATIC 15SC-225 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                   |                   | Collet                                        | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.41.11 DRILLS                                                                                                                                                                                                                                               |                   |                                               |                   |          |              |
| TS.514.41.11<br>MK 2 (0.161")                                                                                                                                                                                                                                     | 0.00" - 0.37"     | 624469-3                                      | 0.00" - 0.37"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 624972-8                                      | 0.18" - 0.62"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 629034                                        | 0.43" - 0.87"     | 627013-6 |              |
| TS.514.41.11<br>MK 4 (0.171")                                                                                                                                                                                                                                     | 0.00" - 0.37"     | 624141-8                                      | 0.00" - 0.37"     | 623908-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 623909-9                                      | 0.18" - 0.62"     | 623926-3 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 623789-5                                      | 0.43" - 0.87"     | 623790-3 |              |
| TS.514.41.11<br>MK 5 (0.201")                                                                                                                                                                                                                                     | 0.00" - 0.37"     | 623253-2                                      | 0.00" - 0.37"     | 623254-0 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 624266-3                                      | 0.18" - 0.62"     | 624267-1 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 624739-9                                      | 0.43" - 0.87"     | 623804-2 |              |
| TS.514.41.11<br>MK 6 (0.189")                                                                                                                                                                                                                                     | 0.00" - 0.37"     | 623356-3                                      | 0.00" - 0.37"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 622878-7                                      | 0.18" - 0.62"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 623104-7                                      | 0.43" - 0.87"     | 623105-4 |              |
| TS.514.41.11<br>MK 7 (0.1865")                                                                                                                                                                                                                                    | 0.00" - 0.37"     | 623318-3                                      | 0.00" - 0.37"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 622880-3                                      | 0.18" - 0.62"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 624002-2                                      | 0.43" - 0.87"     | 623105-4 |              |
| Notes: 1. Use return spring 622833.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum and maximum values if using a 0.100" template boss). |                   |                                               |                   |          |              |

**Table 3 - Q-Matic 15SC-225 Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                      | MATERIAL STACK-UP | Q-MATIC 15SC-225 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                   |                   | Collet                                        | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.41.11 DRILLS                                                                                                                                                                                                                                               |                   |                                               |                   |          |              |
| TS.514.41.11<br>MK 8 (0.2465")                                                                                                                                                                                                                                    | 0.00" - 0.37"     | 623728-3                                      | 0.00" - 0.37"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 622895-1                                      | 0.18" - 0.62"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 623292-0                                      | 0.43" - 0.87"     | 623293-8 |              |
| TS.514.41.11<br>MK 9 (0.159")                                                                                                                                                                                                                                     | 0.00" - 0.37"     | 623354-8                                      | 0.00" - 0.37"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 623355-5                                      | 0.18" - 0.62"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 627012-8                                      | 0.43" - 0.87"     | 627013-6 |              |
| TS.514.41.11<br>MK 10 (0.253")                                                                                                                                                                                                                                    | 0.00" - 0.37"     | 623357-1                                      | 0.00" - 0.37"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 623358-9                                      | 0.18" - 0.62"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 623413-2                                      | 0.43" - 0.87"     | 623293-8 |              |
| TS.514.41.11<br>MK 11 (0.2455")                                                                                                                                                                                                                                   | 0.00" - 0.37"     | 623728-3                                      | 0.00" - 0.37"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.38" - 0.62"     | 622895-1                                      | 0.18" - 0.62"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.63" - 0.87"     | 623292-0                                      | 0.43" - 0.87"     | 623293-8 |              |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                   |                   |                                               |                   |          |              |
| TS.514.43.11<br>MK 1 (0.1850")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623318-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622880-3                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 624002-2                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 3 (0.159")                                                                                                                                                                                                                                     | 0.00" - 0.59"     | 623354-8                                      | 0.00" - 0.59"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 623355-5                                      | 0.05" - 0.84"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 627012-8                                      | 0.30" - 1.09"     | 627013-6 |              |
| TS.514.43.11<br>MK 4 (0.161")                                                                                                                                                                                                                                     | 0.00" - 0.59"     | 624469-3                                      | 0.00" - 0.59"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 624972-8                                      | 0.05" - 0.84"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 629034                                        | 0.30" - 1.09"     | 627013-6 |              |
| TS.514.43.11<br>MK 5 (0.189")                                                                                                                                                                                                                                     | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 7 (0.190")                                                                                                                                                                                                                                     | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 8 (0.171")                                                                                                                                                                                                                                     | 0.00" - 0.59"     | 624141-8                                      | 0.00" - 0.59"     | 623908-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 623909-9                                      | 0.05" - 0.84"     | 623926-3 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623789-5                                      | 0.30" - 1.09"     | 623790-3 |              |
| Notes: 1. Use return spring 622833.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum and maximum values if using a 0.100" template boss). |                   |                                               |                   |          |              |

**Table 3 - Q-Matic 15SC-225 Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                      | MATERIAL STACK-UP | Q-MATIC 15SC-225 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                   |                   | Collet                                        | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                   |                   |                                               |                   |          |              |
| TS.514.43.11<br>MK 9 (0.1850")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623318-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622880-3                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 624002-2                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 10 (0.201")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623253-2                                      | 0.00" - 0.59"     | 623254-0 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 624266-3                                      | 0.05" - 0.84"     | 624267-1 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 624739-9                                      | 0.30" - 1.09"     | 623804-2 |              |
| TS.514.43.11<br>MK 12 (0.1865")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 13 (0.1865")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 14 (0.246")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| TS.514.43.11<br>MK 16 (0.159")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623354-8                                      | 0.00" - 0.59"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 623355-5                                      | 0.05" - 0.84"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 627012-8                                      | 0.30" - 1.09"     | 627013-6 |              |
| TS.514.43.11<br>MK 17 (0.190")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 18 (0.161")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 624469-3                                      | 0.00" - 0.59"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 624972-8                                      | 0.05" - 0.84"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 629034                                        | 0.30" - 1.09"     | 627013-6 |              |
| TS.514.43.11<br>MK 19 (0.1865")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 20 (0.1890")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| Notes: 1. Use return spring 622833.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum and maximum values if using a 0.100" template boss). |                   |                                               |                   |          |              |

**Table 3 - Q-Matic 15SC-225 Collet Assembly Selection**

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                      | MATERIAL STACK-UP | Q-MATIC 15SC-225 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                   |                   | Collet                                        | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                   |                   |                                               |                   |          |              |
| TS.514.43.11<br>MK 21 (0.2460")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| TS.514.43.11<br>MK 22 (0.1860")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623318-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622880-3                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 624002-2                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 23 (0.1605")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 624469-3                                      | 0.00" - 0.59"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 624972-8                                      | 0.05" - 0.84"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 629034                                        | 0.30" - 1.09"     | 627013-6 |              |
| TS.514.43.11<br>MK 24 (0.1605")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 624469-3                                      | 0.00" - 0.59"     | 623359-7 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 624972-8                                      | 0.05" - 0.84"     | 623360-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 629034                                        | 0.30" - 1.09"     | 627013-6 |              |
| TS.514.43.11<br>MK 25 (0.1855")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623318-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622880-3                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 624002-2                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 26 (0.1855")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623318-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622880-3                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 624002-2                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 27 (0.1865")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623356-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622878-7                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623104-7                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.43.11<br>MK 28 (0.2455")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| TS.514.43.11<br>MK 29 (0.2455")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| Notes: 1. Use return spring 622833.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum and maximum values if using a 0.100" template boss). |                   |                                               |                   |          |              |

Table 3 - Q-Matic 15SC-225 Collet Assembly Selection

| DRILL OR DRILL/CSK SPECIFIED                                                                                                                                                                                                                                      | MATERIAL STACK-UP | Q-MATIC 15SC-225 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                   |                   | Collet                                        | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.43.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                   |                   |                                               |                   |          |              |
| TS.514.43.11<br>MK 30 (0.2455")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
|                                                                                                                                                                                                                                                                   | 1.10" - 1.34"     | 623289-6                                      | 0.55" - 1.34"     | 623290-4 |              |
|                                                                                                                                                                                                                                                                   | 1.35" - 1.59"     | 624003-0                                      | 0.80" - 1.59"     | 624004-8 |              |
|                                                                                                                                                                                                                                                                   | 1.60" - 1.84"     | 623709-3                                      | 1.05" - 1.84"     | 623713-5 |              |
| TS.514.43.11<br>MK 31 (0.3075")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 625488-2                                      | 0.00" - 0.59"     | 624474-3 | 622253-3     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622896-9                                      | 0.05" - 0.84"     | 622898-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 622667-4                                      | 0.30" - 1.09"     | 622668-2 |              |
|                                                                                                                                                                                                                                                                   | 1.10" - 1.34"     | 623999-0                                      | 0.55" - 1.34"     | 623324-1 |              |
|                                                                                                                                                                                                                                                                   | 1.35" - 1.59"     | 624000-6                                      | 0.80" - 1.59"     | 624001-4 |              |
|                                                                                                                                                                                                                                                                   | 1.60" - 1.84"     | 623707-7                                      | 1.05" - 1.84"     | 623719-2 |              |
| TS.514.43.11<br>MK 32 (0.2460")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
|                                                                                                                                                                                                                                                                   | 1.10" - 1.34"     | 623289-6                                      | 0.55" - 1.34"     | 623290-4 |              |
|                                                                                                                                                                                                                                                                   | 1.35" - 1.59"     | 624003-0                                      | 0.80" - 1.59"     | 624004-8 |              |
|                                                                                                                                                                                                                                                                   | 1.60" - 1.84"     | 623709-3                                      | 1.05" - 1.84"     | 623713-5 |              |
| TS.514.43.11<br>MK 33 (0.1860")                                                                                                                                                                                                                                   | 0.00" - 0.59"     | 623318-3                                      | 0.00" - 0.59"     | 623319-1 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622880-3                                      | 0.05" - 0.84"     | 622879-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 624002-2                                      | 0.30" - 1.09"     | 623105-4 |              |
| TS.514.63.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                   |                   |                                               |                   |          |              |
| TS.514.63.11MK 1<br>(0.2450")                                                                                                                                                                                                                                     | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| TS.514.63.11<br>MK 2 (0.2455")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| TS.514.63.11<br>MK 3 (0.2455")                                                                                                                                                                                                                                    | 0.00" - 0.59"     | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"     | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"     | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| Notes: 1. Use return spring 622833.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum and maximum values if using a 0.100" template boss). |                   |                                               |                   |          |              |

**Table 3 - Q-Matic 15SC-225 Collet Assembly Selection**

| DRILL OR DRILL/CSK<br>SPECIFIED                                                                                                                                                                                                                                   | MATERIAL<br>STACK-UP | Q-MATIC 15SC-225 COLLET ASSEMBLY PART NUMBERS |                   |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------|-------------------|----------|--------------|
|                                                                                                                                                                                                                                                                   |                      | Collet                                        | Collet Grip Range | Mandrel  | Collet Guide |
| TS.514.63.11 DRILL/COUNTERSINKS                                                                                                                                                                                                                                   |                      |                                               |                   |          |              |
| TS.514.63.11<br>MK 4 (0.3085")                                                                                                                                                                                                                                    | 0.00" - 0.59"        | 625488-2                                      | 0.00" - 0.59"     | 624474-3 | 622253-3     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"        | 622896-9                                      | 0.05" - 0.84"     | 622898-5 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"        | 622667-4                                      | 0.30" - 1.09"     | 622668-2 |              |
| TS.514.63.11<br>MK 5 (0.2455")                                                                                                                                                                                                                                    | 0.00" - 0.59"        | 623728-3                                      | 0.00" - 0.59"     | 623361-3 | 622252-5     |
|                                                                                                                                                                                                                                                                   | 0.60" - 0.84"        | 622895-1                                      | 0.05" - 0.84"     | 622897-7 |              |
|                                                                                                                                                                                                                                                                   | 0.85" - 1.09"        | 623292-0                                      | 0.30" - 1.09"     | 623293-8 |              |
| Notes: 1. Use return spring 622833.<br>2. Collet grip range is the thickness of stacked material that the collet can successfully grip, based on a standard 0.150" template boss (add 0.050" to both minimum and maximum values if using a 0.100" template boss). |                      |                                               |                   |          |              |

**Table 4 - Spacematic Model 1000 Template Boss Part Numbers**

| TEMPLATE HOLE DIAMETER                                                                                | COUNTERSINK DIAMETER | 0.150" LONG TEMPLATE BOSS |
|-------------------------------------------------------------------------------------------------------|----------------------|---------------------------|
| 0.437"                                                                                                | 0.271"               | 5430409                   |
|                                                                                                       | 0.286"               | 5430410                   |
|                                                                                                       | 0.317"               | 5430422                   |
| 0.500"                                                                                                | 0.271"               | 5430434                   |
|                                                                                                       | 0.286"               | 5430446                   |
|                                                                                                       | 0.317"               | 5430458                   |
|                                                                                                       | 0.349"               | 5430471                   |
|                                                                                                       | 0.380"               | 5430483                   |
| 0.625"                                                                                                | 0.317"               | 5430495                   |
|                                                                                                       | 0.349"               | 5430501                   |
|                                                                                                       | 0.380"               | 5430513                   |
|                                                                                                       | 0.411"               | 5430525                   |
| Note: The selected template boss should be at least 0.020" longer than the thickness of the template. |                      |                           |

**Table 5 - Q-Matic 136SC-118 Template Boss Part Numbers**

| TEMPLATE HOLE DIAMETER | COUNTERSINK DIAMETER | 0.150" LONG TEMPLATE BOSS |
|------------------------|----------------------|---------------------------|
| 0.434"                 | 0.271"               | 623573-3                  |
|                        | 0.286"               | 623574-1                  |
|                        | 0.317"               | 623575-8                  |
| 0.497"                 | 0.271"               | 623576-6                  |
|                        | 0.286"               | 623577-4                  |
|                        | 0.317"               | 623578-2                  |
|                        | 0.349"               | 623579-0                  |
|                        | 0.380"               | 623580-8                  |
| 0.559"                 | 0.380"               | 624284-6                  |
|                        | 0.505"               | 627512-7                  |
| 0.622"                 | 0.317"               | 623581-6                  |
|                        | 0.349"               | 623582-4                  |
|                        | 0.380"               | 623583-2                  |
|                        | 0.411"               | 623584-0                  |
|                        | 0.489"               | 623585-7                  |
|                        | 0.505"               | 623586-5                  |
| 0.697"                 | 0.505"               | 627513-5                  |
| 0.747"                 | 0.505"               | 625685-3                  |

**Table 6 - Q-Matic 15SC-225 Template Boss Part Numbers**

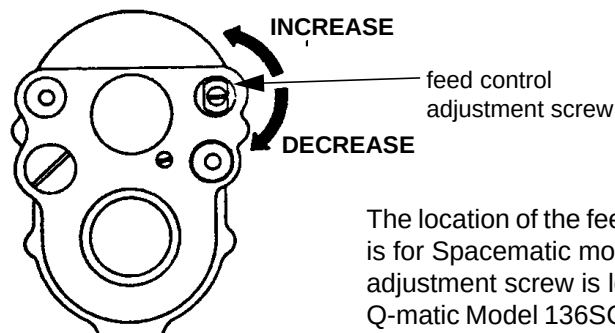
| TEMPLATE HOLE DIAMETER | COUNTERSINK DIAMETER | 0.150" LONG TEMPLATE BOSS |
|------------------------|----------------------|---------------------------|
| 0.500"                 | 0.375"               | 624087-3                  |
| 0.625"                 | 0.500"               | 623708-5                  |
| 0.750"                 | 0.500"               | 627421-1                  |
|                        | 0.625"               | 623720-0                  |
| 0.875"                 | 0.750"               | 623716-8                  |
| 1.000"                 | 0.625"               | 627422-9                  |
|                        | 0.781"               | 623725-9                  |
|                        | 0.875"               | 624034-5                  |
| 1.250"                 | 0.875"               | 624486-7                  |



## 5.3 Adjustment of Drillmotor

### 5.3.1 Rate of Feed Adjustment

- 5.3.1.1 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, adjust the feed rate of the drillmotor by turning the feed control adjustment screw as shown in [Figure 5](#).



The location of the feed rate adjustment screw, as shown, is for Spacematic model 1000 drillmotor. The feed rate adjustment screw is located on the feed spindle for Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors.

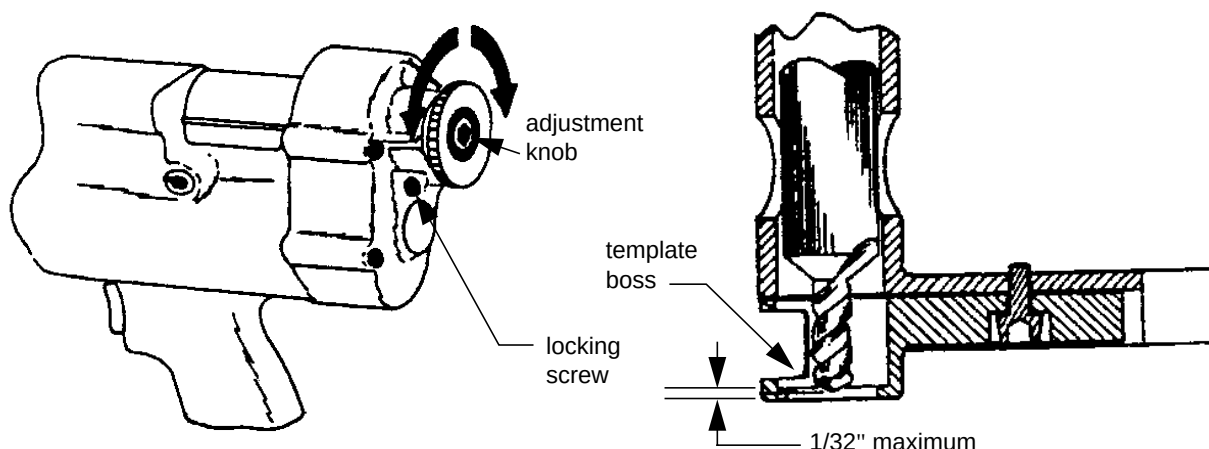
**Figure 5 - Rate of Feed Adjustment**

- 5.3.1.2 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), adjust the feed rate of the drillmotor according to the equipment manufacturer's instructions.

### 5.3.2 Drill Point to Work Surface Adjustment

- 5.3.2.1 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, adjust the drill point to work surface clearance as follows (see [Figure 6](#)):

- Step 1. Loosen the adjustment knob locking screw.
- Step 2. Turn the adjustment knob to extend or retract the drill point so that the tip is flush to 1/16" below flush with the end of the template boss.
- Step 3. Re-tighten the locking screw.



**Figure 6 - Drill Point to Work Surface Adjustment**

- 5.3.2.2 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), adjust the drill point to work surface clearance according to the equipment manufacturer's instructions.

### 5.3.3 Drill and Countersink Depth Adjustment

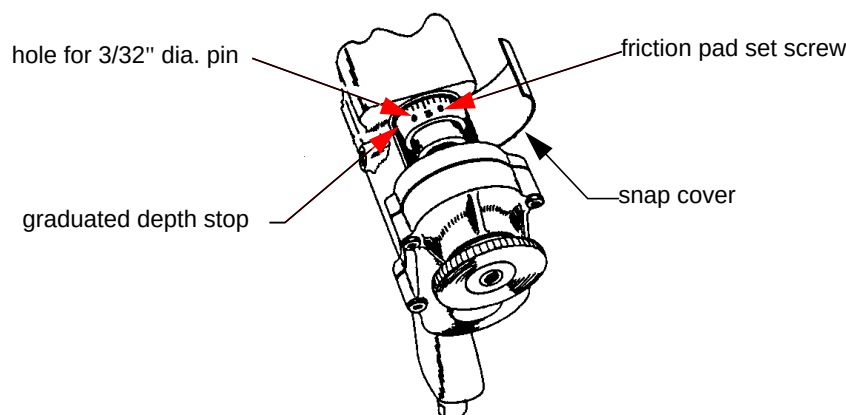
- 5.3.3.1 Before drilling production parts, drill test holes according to [section 5.4](#) to verify that the drill/countersink depth is correct for the type and size of fastener to be installed and that the drilled hole size is within the range specified in the applicable fastener PPS.

- 5.3.3.2 The countersink depth should be set to 0.002" - 0.003" less than the final countersink dimensions. Afterwards, use a conventional micro-stop countersink to finish each countersink for the specific fastener being installed in that hole.

- 5.3.3.3 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, adjust the drill/countersink depth as follows (see [Figure 7](#)):

- Step 1. If the depth stop is excessively tight, loosen the necessary friction pad set screws.
- Step 2. Rotate the depth stop, located under the snap cover on top of the tool, to increase or decrease the countersink depth as required. One Spacematic depth stop graduation is equal to approximately 0.002" of countersink depth; one Q-matic graduation is equal to approximately 0.001".
- Step 3. Re-tighten the friction pad set screws and close the snap cover.

- 5.3.3.4 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), adjust the drill/countersink depth according to the equipment manufacturer's instructions.

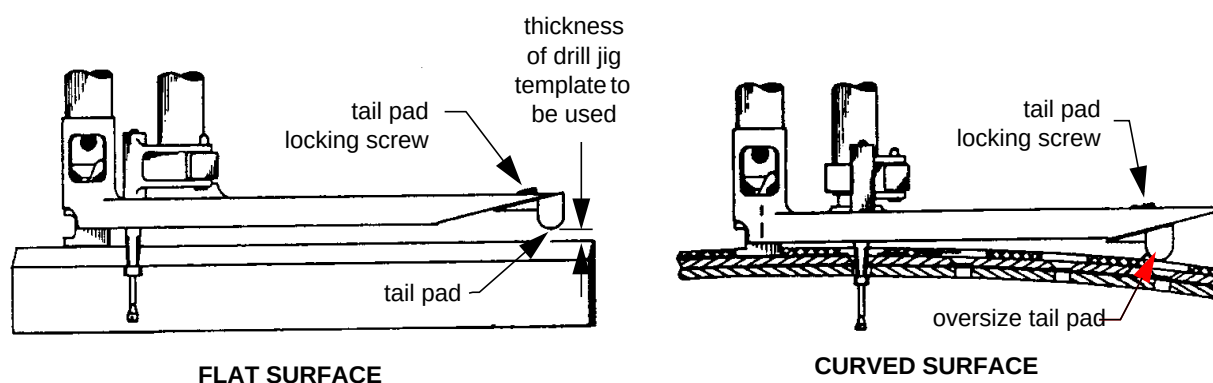


**Figure 7 - Drill/Countersink Depth Adjustment**

### 5.3.4 Tail Pad Adjustment

5.3.4.1 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, adjust the tail pad height as follows (see [Figure 8](#)):

- Step 1. Slide the tail pad along the template foot so that, when the drillmotor is in position on the drill template, the drill is at right angles to the work surface. On curved skin panels, it may be necessary to use an oversize tail pad on the Spacematic drillmotor to properly set the drillmotor at right angles to the work.
- Step 2. Secure the tail pad by tightening the tail pad locking screw.



**Figure 8 - Tail Pad Adjustment**

5.3.4.2 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), adjust the tail pad height according to the equipment manufacturer's instructions.

## 5.3.5 Pressurizing the Foot Piston

5.3.5.1 It is recommended that at the start of each production shift and at least once during each shift, the foot piston on Spacematic Model 1000 drillmotors be pressurized without booster pumps as follows:

- Step 1. Connect the drillmotor to an air source.
- Step 2. Pull the trigger to retract the collet finger and insert a wood block between the collet finger and template foot. Use the 1 1/2" side of the block as shown in [Figure 9](#).
- Step 3. Release the trigger.
- Step 4. Pressurize the foot piston as necessary to maintain the colleting pressure.
- Step 5. Pull the trigger to retract the collet finger.
- Step 6. Remove the wood block.
- Step 7. Release the trigger.

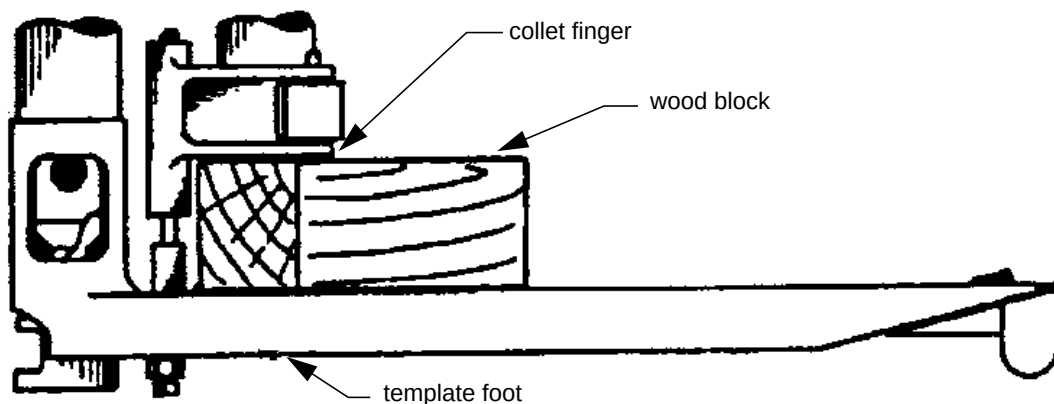


Figure 9 - Pressurizing the Foot Piston

5.3.5.2 For automatic, portable drillmotors other than the Spacematic Model 1000 drillmotor, it is recommended that the foot piston be pressurized without booster pumps, as applicable, according to the equipment manufacturer's instructions:

## 5.3.6 Automatic Spray Lubricator Adjustment

5.3.6.1 For Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 drillmotors, adjust the amount of lubrication delivered to the cutter, as required, by rotating the screw located on the side of the spray lubricator container (counter-clockwise to increase lubrication; clockwise to decrease lubrication).

- 5.3.6.2 For drillmotors other than the Spacematic Model 1000, Q-matic Model 136SC-118 and Q-matic Model 15SC-225 (e.g., Hi Shear M1500 II or Doler Model P315 drillmotors), adjust the amount of lubrication delivered to the cutter, as required, according to the equipment manufacturer's instructions.

## 5.4 Operation of the Drillmotor

- 5.4.1 Before drilling or drill/countersinking holes in production parts, drill test holes in scrap pieces of similar material and gauge as the production parts and perform the following tests:
- Check hole diameters using the applicable GO/NO-GO gauge to ensure that they are within the tolerances specified on the engineering drawing or fastener PPS.
  - Check countersink diameters with a countersink gauge according to [PPS 1.33](#). Adjust countersink depth as required, according to [section 5.3.3](#), to produce countersink diameters within the tolerances specified on the engineering drawing or fastener PPS.
  - Re-check the countersink depth every time the drill/countersink is replaced.

- 5.4.2 Using the appropriate drill template, drill the hole pattern as follows:

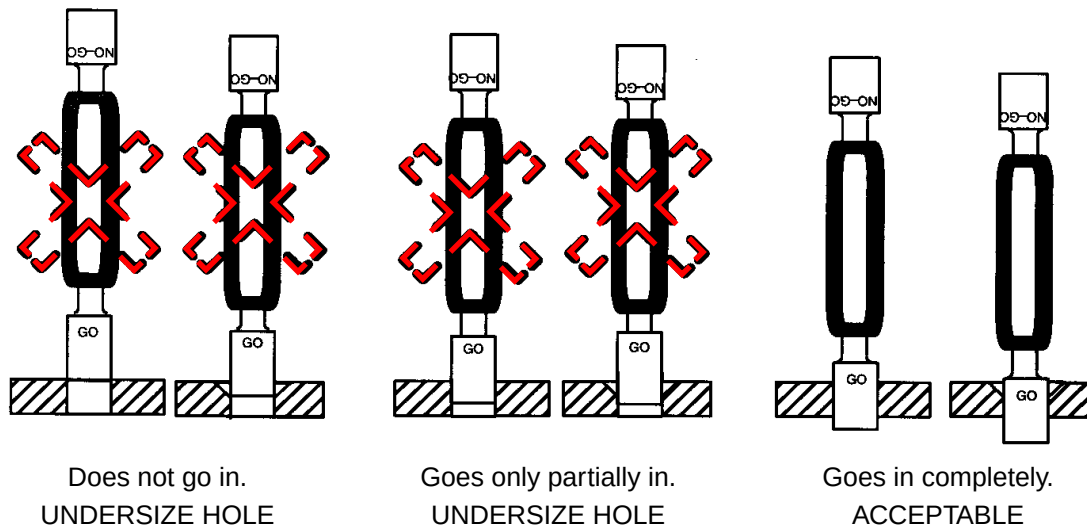
- Step 1. Position and secure the applicable drill template on the assembly using Cleco-type fasteners. If necessary, use template fasteners to hold parts together during the drilling operation. These fasteners are installed in undersized holes (e.g., if installing a 5/32" rivet, use a 1/8" template fastener) and drilled off in the parts using a standard drill and the appropriate drill template starter fixture (e.g., as selected from [Table 7](#)) for the size of template fastener being used. To ensure that there is no excessive gap between the skin and spar, use a sufficient number of template fasteners.

**Table 7 - Drill Template Starter Fixtures**

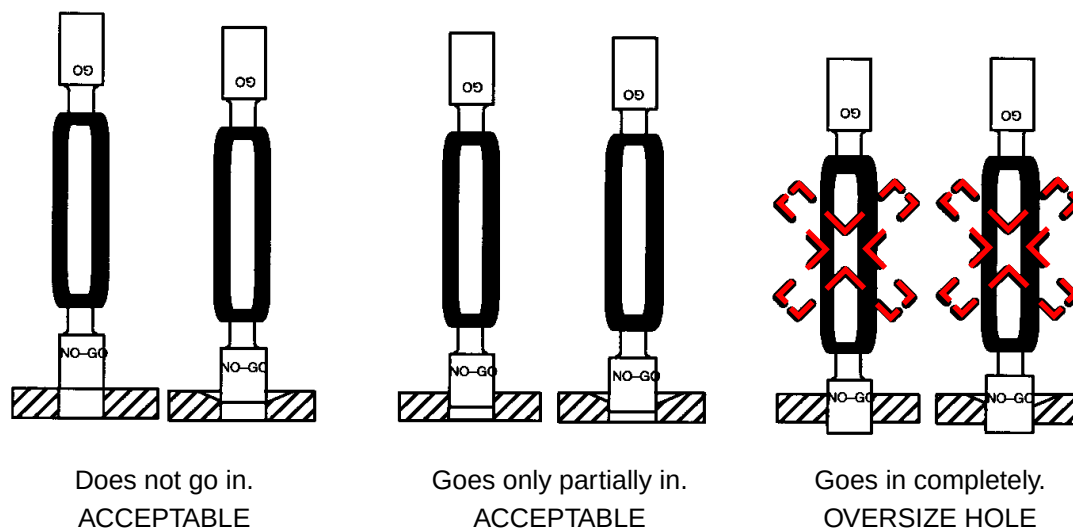
| DRILL DIAMETER                                                                  | TS.519.11.52 STARTER DRILL FIXTURE |  | DRILL DIAMETER | TS.519.11.52 STARTER DRILL FIXTURE |
|---------------------------------------------------------------------------------|------------------------------------|--|----------------|------------------------------------|
| 0.098" (#40)                                                                    | MK 5                               |  | 0.189" (#12)   | MK 6                               |
| 0.128" (#30)                                                                    | MK 1                               |  | 0.191" (#11)   | MK 3                               |
| 0.141" (#28)                                                                    | MK 9                               |  | 0.201" (#7)    | MK 7                               |
| 0.144" (#27)                                                                    | MK 12                              |  | 0.228" (#1)    | MK 14                              |
| 0.161" (#20)                                                                    | MK 2                               |  | 0.250" (1/4")  | MK 10                              |
| 0.171" (11/64")                                                                 | MK 11                              |  | 0.257" (F)     | MK 4                               |
| 0.177" (#16)                                                                    | MK 13                              |  | 0.266" (H)     | MK 8                               |
| Note: Fixtures are suitable for both 0.500" and 0.625" diameter template holes. |                                    |  |                |                                    |

- Step 2. Using a standard drill and the appropriate drill fixture (e.g., from [Table 7](#)), drill a starting hole into which the collet will fit. If the correct size of drill fixture is not available, use a standard drill to pre-drill the next smaller sized pilot hole, then produce the required final size using a standard drill and an appropriate piloted reamer (e.g., TS.561.11.13) or piloted double margin drill (e.g., TS.561.11.16).
- Step 3. Insert the drillmotor collet into the starting hole and insert the template boss into the next hole to be drilled in the template. Hold the drillmotor firmly against the work so that the template boss touches the work surface and the tail pad rests squarely on the drill template.
- Step 4. If the drillmotor is not equipped with an automatic spray lubricator, lubricate drills or drill/countersinks with Boelube as follows:
- for close tolerance holes, lubricate before every hole drilled
  - for standard installations, lubricate before every sixth to tenth hole drilled
- Step 5. Press the trigger to actuate the following drillmotor sequence:
- The collet finger retracts to pull up the collet and secure the drillmotor against the work surface.
  - The template foot retracts to feed the drill into the work surface.
  - At the end of the pre-set drill stroke, the drillmotor shuts off, the collet releases and the template foot is extended.
- On the Spacematic Model 1000 drillmotor, if the trigger is released at any time during this drilling cycle, the drillmotor shuts off and the collet releases. Never attempt to re-drill a hole with an automatic, portable drillmotor. Partially drilled holes must be finished with a standard drill. When withdrawing the collet from a hole, take care to draw the collet straight out to prevent bending of the collet and mandrel.
- Step 6. On flat surfaces, drill off as many holes as can be reached with the collet in the starting hole position. On curved surfaces, drill off only the hole adjacent to the starting hole.
- Step 7. Check the holes for conformance to the hole limits requirements using a Go/No-Go gauge (see [Figure 10](#)), a plug gauge or other hole measuring gauge. Also check the hole ovality; the minor and major diameters of the hole must be within the minimum and maximum hole diameter tolerances, respectively. If the hole is oversize, it must be referred to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for written authorization to repair and for the applicable oversize fastener. When drilling a pattern of holes, it is recommended that at least the first and every tenth hole thereafter be checked **during** drilling and the remaining holes be checked **after** drilling.
- Step 8. Insert the collet into the last drilled hole and drill off the next hole or series of holes, according to [paragraph 3](#) through [paragraph 6](#), and repeat until all of the holes in the pattern are drilled.
- Step 9. Remove the template.

Step 10. If required, countersink holes using a conventional micro-stop countersink according to [PPS 1.33](#).



## USE OF GO END

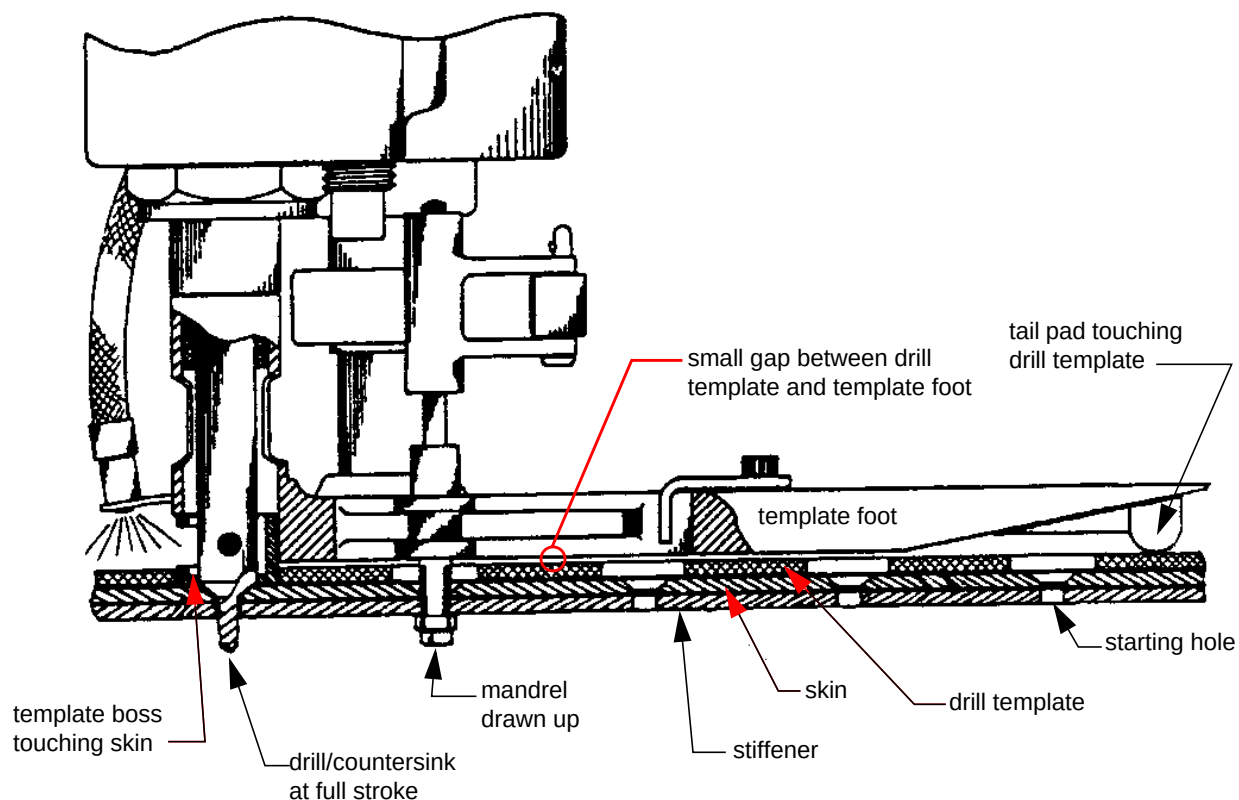


## USE OF NO-GO END

Figure 10 - Use of Go/No-Go Gauges

## 5.5 Air Blast Assembly

- 5.5.1 The Spacematic drillmotor is fitted with an air blast assembly which consists of a flexible hose connected to the drillmotor and a nozzle attached to the template foot adjacent to the template boss (see [Figure 11](#)). The Q-matic drillmotor blows air through its spindle.
- 5.5.2 When operating the drillmotor, the air blast blows the metal chips clear of the drill template holes to ensure that the template boss seats properly against the work surface.



**Figure 11 - Typical Drill Countersinking Operation**

## 6 Requirements

- 6.1 Drilled holes and countersinks shall meet the requirements for size, concentricity, angularity and finish as specified by the engineering drawing and/or fastener PPS.

## 7 Safety Precautions

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



- 7.2 Always wear Bombardier Toronto (de Havilland) approved safety glasses when operating automatic, portable drillmotors.
- 7.3 Wear personal protective respiratory equipment according to PPS 13.13 when operating automatic, portable drillmotors equipped with automatic spray lubricators.
- 7.4 Ensure that the air line is disconnected from the drillmotor when changing or installing the drill bit, collet assembly and template boss.

## 8 Personnel Requirements

- 8.1 Personnel must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

## 9 Recommended Maintenance of Equipment

- 9.1 At the beginning of every shift, inject five drops of 3-in-1 oil into the air inlet of the drillmotor being used.
- 9.2 When the fluid level indicating rod on the side of the tool reaches the ADD FLUID mark, re-fill it with hydraulic fluid according to the manufacturer's instructions.
- 9.3 If the drillmotor functions incorrectly, adjust or repair it according to the equipment manufacturer's instructions.