KEY RECOMMENDATIONS

- Referring to the enclosed table, check for the crimping diameter and select the die-set with the closest size.
- The use of die-sets, with diameter significantly smaller than the recommended one, can cause ferrule flowering (i.e. ferrule surface with pinches between the dies) and cracks during the crimping operation.
- The die-set selection should be done ensuring the maximum die landing on the ferrule surface with the minimum flowering effect. This will provide a proper crimping, reducing the risk of ferrule surface cracks and damage of the protective zinc-plating.
- The use of recommended Manuli hoses, fittings, machines and tools ensure an optimized performance results.
- Limited quantities of light paraffinic oils can be used to obtain an easier insert pushing operation.

To download this document and get more detailed information, please visit: www.manuli-hydraulics.com "Assembling Information & Instructions" and "Assembling Procedure Presentation".

MANULI OFFERS AN INTEGRATED PACKAGE

Ref. Products Range Catalogues

Composed by:

- HOSES
- FITTINGS
- QUICK COUPLINGS
- ADAPTORS
- MANIPULATED TUBES
- WATER CLEANING AND BLASTING
- DRILLING
- MINING
- ASSEMBLING MACHINES
- HYDRAULIC AND REFRIGERATION ASSEMBLIES
- HOSE PROTECTIONS
HYDRAULIC ASSEMBLING PROCEDURE

1 – COMPONENTS SELECTION
Select the specified hoses, ferrules and inserts using the most updated MRI Fluid Connectors Catalogue release.

2 – HOSE CUTTING
Cut squarely the hose (cut angle must be ± 3°). In order to ensure a correct cut (minimum rosetting and tulip effect due to the heat damage to the rubber), it is recommended to use the appropriate blade type:
- wire spiral, large bore wire braided (≥ DN31) & Spiritec: use a smooth blade.
- wire braided small bore (≤ DN31): use a serrated blade.
Use of scalloped blade (with wavy edge) is acceptable for all hose types.

3 – SKIVING OPERATIONS
When skiving is required, set-up the skiving machine such that the front edge of the knife is set to the correct length (refer to crimping chart: tolerance -/- 0.5 mm; +/0.02 inch). It is important to remove the maximum thickness of the rubber hose cover without damaging or displacing the reinforcement steel wires.

4 – FITTINGS MOUNTING
- In case of MF2000 two-piece fittings, mount the ferrule fully onto the hose, and then push the insert fully into the hose.
- In case of MF5000 one-piece fittings, mark the hose insertion depth (distance from the bottom of the ferrule to its end to be measured by calipers) on the hose cover and push the coupling fully into the hose up to the mark made on the hose cover.
Especially in case of large hose sizes and Interlock type fittings the use of a proper pushing machine is recommended to facilitate this operation.

5 – DIE-SETS SELECTION FOR MANULI CRIMPING MACHINES
Choose the die-set closest to and smaller than the specified Crimping Diameter + 0.4 mm. The 0.4 mm correction is necessary to assure the requested crimping diameter, allowing some ferrule bulging among the dies, when crimping close to the dies closure diameter.

Examples:
- For achieving a finished crimping diameter of 23.5 mm choose the die-set marked 21 as it is closest to and smaller than 23.5 - 0.4 = 23.1.
- For achieving a finished crimping diameter of 24.1 mm don’t use the die-set marked 24 but use the die-set marked 21 as it is closest to and smaller than 24.1 - 0.4 = 23.7.

HYDRAULIC ASSEMBLING PROCEDURE

CRIMPING CONTROL STEPS

STEP 1. Inspect the crimping dimension in the die-set landing area as indicated in the picture below:

STEP 2. Take four measurements across the crimped ferrule at 45° to each other using vernier calipers or micrometers in the middle section of the ferrule crimp length.

STEP 3. Calculate the Crimping Diameter as the average of the four measurements taken in the middle.

STEP 4. Verify that the actual Crimping Diameter measured is within the specified tolerance range of (0/-0.2 mm) of that specified in the relevant Manuli MF Crimping Parameters Chart.

STEP 5. If the measured crimping diameter is outside the specified crimping diameter limits, calculate the difference between measured and specified value; if this difference is more than 0.2 mm mark an X on this ferrule.

- If the measured crimping diameter is larger than the specified crimping diameter, reduce the crimping setting appropriately by the difference and recrimp the ferrule, restarting from STEP 1.
- If the measured crimping diameter is smaller than the lower limit of the specified crimping diameter, increase the crimping setting appropriately by the difference and proceed to crimp the other end fitting of the assembly, restarting from STEP 1.

Examples:
- If the measured value is 23.8 mm with respect to the specified value of 23.5 mm, the difference is 0.3 mm; mark an X on the ferrule and reduce the crimping setting by 0.3 x 100 = 30 in case of Manuli crimping machine with numerical vernier dial gauge and recrimp (*) the same ferrule.
- If the measured crimping diameter is smaller than the lower limit of the specified crimping diameter, increase the crimp setting by 0.4 mm, then 0.4 - 0.4 = 0 mm, the difference is 0.3 mm; mark an X on the ferrule and reduce the crimping setting by 0.3 x 100 = 30 in case of Manuli crimping machine with numerical vernier dial gauge and recrimp (*) the same ferrule.

Examples:
- If the measured value is 23.8 mm with respect to the specified value of 23.5 mm, the difference is 0.3 mm; mark an X on the ferrule and reduce the crimping setting by 0.3 x 100 = 30 in case of Manuli crimping machine with numerical vernier dial gauge and recrimp (*) the same ferrule.

* After completion of this preliminary crimping machine set-up phase, changing of crimper setting and double strike of the ferrule to achieve specified crimping diameter is not allowed anymore.

STEP 6. Calculate the Crimp Ovality as the maximum difference between the four measurements taken in the middle (maximum value = minimum value).

STEP 7. If the Crimp Ovality calculated is more than 0.2mm, mark an X on the ferrule; inspect the machine die-head, springs and dies functioning and replace/repair defective parts.

STEP 8. Calculate the Crimp Taper as the difference between the average diameter measured at the top of the ferrule (Termination End side) and the average diameter measured at the bottom of the ferrule.

STEP 9. Verify that the Ferrule Taper satisfies the following limits:
- Taper ≤ 0.3 mm for hose size up to and including DN16 (5/8 inch)
- Taper ≤ 0.6 mm for hose size from DN19 (3/4" inch) up to and including DN76 (3 inch)

STEP 10. If the Crimp Taper calculated is outside the above limits, mark an X on the ferrule; inspect the machine die-head, springs and dies functioning and replace/repair defective parts.

STEP 11. Scrap any assembly marked with X on the ferrule. Now the crimping machine setup is complete and the machine is ready for crimping other assemblies of the same type.
<table>
<thead>
<tr>
<th>HOSE TYPE</th>
<th>CRIMPING PARAMETERS CHART</th>
<th>HOSE TYPE</th>
<th>CRIMPING PARAMETERS CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEILDMASTER®/2000 SHIELDMASTER®/6000 MINE</td>
<td>D1 - Dash Size</td>
<td>SHEILDMASTER®/2000 SHIELDMASTER®/6000 MINE</td>
<td>D1 - Dash Size</td>
</tr>
<tr>
<td>ASTRO/3</td>
<td>16.1 17.9 18.7 20.6 23.5 27.0 30.9 39.2 48.6 57.0 69.5 76.1</td>
<td>ASTRO/3</td>
<td>16.1 17.9 18.7 20.6 23.5 27.0 30.9 39.2 48.6 57.0 69.5 76.1</td>
</tr>
<tr>
<td>MULTITEX</td>
<td>12.1 14.4 15.6 18.1 21.7</td>
<td>MULTITEX</td>
<td>12.1 14.4 15.6 18.1 21.7</td>
</tr>
<tr>
<td>COVER</td>
<td>14.6 15.0 16.0 18.4 22.6 26.1</td>
<td>COVER</td>
<td>14.6 15.0 16.0 18.4 22.6 26.1</td>
</tr>
</tbody>
</table>
**Hose Cleaning & Blasting**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Skive length mm</td>
<td>14.4</td>
<td>16.0</td>
<td>19.8</td>
<td>22.6</td>
<td>17.9</td>
<td>18.7</td>
<td>18.8</td>
<td>20.6</td>
<td>20.6</td>
<td>20.6</td>
<td>20.6</td>
<td>24.4</td>
<td>28.4</td>
</tr>
</tbody>
</table>

**Crimping Data Tolerances:**

- **Refrigeration** (Crimping diameter: ±0.1 mm (Refristar, Refrimaster); ±0.2 mm (Refrifast))

<table>
<thead>
<tr>
<th>Hose Cleaning &amp; Blasting Type</th>
<th>Hose Type</th>
<th>DN x Dash Size</th>
<th>mm x Inches</th>
<th>Refistar</th>
<th>Refrimaster</th>
<th>Refrimaster/Plus</th>
<th>Reifast</th>
<th>Hose Type</th>
<th>Hose Type</th>
<th>Hose Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Skive length mm</td>
<td>15.2</td>
<td>20.2</td>
<td>21.3</td>
<td>26.0</td>
<td>30.8</td>
<td>34.4</td>
<td>42.5</td>
<td>14.8</td>
<td>16.3</td>
<td>18.8</td>
</tr>
</tbody>
</table>

**Note:** Recommended crimping diameters are related to Manuli hydraulic hoses and fittings. 

- **Dash Size**

<table>
<thead>
<tr>
<th>Hose Cleaning &amp; Blasting Type</th>
<th>Hose Type</th>
<th>DN x Dash Size</th>
<th>mm x Inches</th>
<th>Dash Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Skive length mm</td>
<td>23.2</td>
<td>27.1</td>
<td>35.2</td>
<td>14.8</td>
</tr>
</tbody>
</table>

**Crimping Data Tolerances:**

- **Refrigeration** (Crimping diameter: ±0.1 mm (Refristar, Refrimaster); ±0.2 mm (Refrifast))

<table>
<thead>
<tr>
<th>Hose Cleaning &amp; Blasting Type</th>
<th>Hose Type</th>
<th>DN x Dash Size</th>
<th>mm x Inches</th>
<th>Refistar</th>
<th>Refrimaster</th>
<th>Refrimaster/Plus</th>
<th>Reifast</th>
<th>Hose Type</th>
<th>Hose Type</th>
<th>Hose Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Skive length mm</td>
<td>15.2</td>
<td>20.2</td>
<td>21.3</td>
<td>26.0</td>
<td>30.8</td>
<td>34.4</td>
<td>42.5</td>
<td>14.8</td>
<td>16.3</td>
<td>18.8</td>
</tr>
</tbody>
</table>

**Note:** Recommended crimping diameters are related to Manuli hydraulic hoses and fittings.

- **Dash Size**

<table>
<thead>
<tr>
<th>Hose Cleaning &amp; Blasting Type</th>
<th>Hose Type</th>
<th>DN x Dash Size</th>
<th>mm x Inches</th>
<th>Dash Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Skive length mm</td>
<td>23.2</td>
<td>27.1</td>
<td>35.2</td>
<td>14.8</td>
</tr>
</tbody>
</table>