Installation/Maintenance

TMP4100-Series

PINSTAMP® Marking Head

This document contains installation and maintenance information for the Telesis TMP4100 and TMP4100E hand-held markers and the Telesis TMP4150 and TMP4155 fixture-mounted marking heads. This document may be supplemented and kept current by Change Notices and Revisions.
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NOTE
The portion of the text affected by the change is indicated by a vertical line in the outer margins of the page. Changes to illustrations (other than diagrams and schematics) are identified with a miniature pointing hand. Shading is used to highlight the area of diagrams and schematics containing a change.

This publication consists of the following pages: ("–" indicates original; integers indicate change)

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Foreword

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Safety Summary

The TMP4100-Series markers use high voltage power supplies and high pressure pneumatic supplies. Accordingly, there is some danger when working with, and near, Pinstamp® marking machines. The following safety precautions should be observed at all times.

♦ Never use the marker in any manner or for any purpose other than that for which it was designed.
♦ Eye protection may be required when working in close proximity of an operating marker.
♦ Ear protection may be required when working with or near an operating marker.
♦ Keep all body parts, jewelry, and clothing clear of the marker while it is operating.
♦ Do not remove or defeat the marker’s safety features or protective guards.
♦ TMP4100, TMP4150, TMP4155: Do not disconnect the tubing while air pressure is applied to the lines.

Warnings, Cautions, and Notes are placed throughout this document to alert you to important information. These messages have the following significance.

WARNING

Warnings contain information that is essential to the personal safety of the user.

CAUTION

Cautions contain information that is essential to avoid damage to the equipment.

NOTE

Notes call attention to information of special importance at specific points within the text.
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Section 1
Installation

1.1 OVERVIEW

This section documents the installation of TMP4100, TMP4100E, TMP4150, and TMP4155 marking heads.

The TMP4100, TMP4150, and TMP4155 heads contain a pneumatic pin that uses air pressure to drive the pin from and return the pin to the pin cartridge. The TMP4100E (electric) head uses no air pressure. The TMP4100E uses an electric solenoid to drive and an internal spring to assist pin return.

Installation of the marking heads is almost identical. Where variation do exist, they will be clearly identified within the text to inform you of the differences.

TMP4100, TMP4100E: The TMP4100 and TMP4100E markers are hand-held markers. They may be used in any orientation except inverted (that is, with the handle pointing upward).

TMP4150, TMP4155: The TMP4150 and TMP4155 are fixture-mounted markers for in-line use. They may be mounted in any orientation except inverted (that is, with the mounting holes pointing upward). Typically, they should be mounted on a tooling fixture with the pin pointing downward. The TMP4150 and TMP4155 marking heads employ a protective boot to help prevent contaminants from entering the marking head cavity.
1.2 SPECIFICATIONS
The marking equipment design and specifications are subject to change without prior notice.

1.2.1 TMP4100 Marking Head

Weight .......................... 4.08 lb. (1.85 kg) marking head with handle
.................................. 5.50 lb. (2.50 kg) marking head with handle and marker cable
Dimensions (L x W x H) ......... 9.19 x 4.55 x 7.93 in. (234 x 116 x 201 mm) with 25XL pin & handle
.................................. 9.44 x 4.55 x 7.93 in. (240 x 116 x 201 mm) with 150S pin & handle
X-axis Travel .................... 2.0 in. (50 mm) maximum
Y-axis Travel .................... 0.3 in. (7.6 mm) maximum
Number of Impact Pins .......... 1
Pin Type ......................... 25XL- or 150S-series
Pin Material ..................... Powered Metal or Carbide (25XL-series)
.................................. Powered Metal or Carbide-tipped (150S-series)
Pin Stroke: 25XL-series pin ..... 0.125 in. (3.1 mm) recommended; 0.5 in. (12.7 mm) maximum
150S-series pin ........ 0.125 in. (3.1 mm) recommended; 0.25 in. (6.35 mm) maximum
Air Consumption 3
At Idle ....................... 0.04 SCFM maximum
While Marking ............... 0.80 SCFM maximum
Operating Temperature .......... 32° to 122°F (0° to 50°C)
Humidity ........................ 0% to 80%

1.2.2 TMP4100E Marking Head

Weight .......................... 4.08 lb. (1.85 kg) marking head with handle
.................................. 5.50 lb. (2.50 kg) marking head with handle and marker cable
Dimensions (L x W x H) ......... 9.91 x 4.55 x 7.93 in. (252 x 116 x 201 mm) with 25XLE pin & handle
X-axis Travel .................... 2.0 in. (50 mm) maximum
Y-axis Travel .................... 0.3 in. (7.6 mm) maximum
Number of Impact Pins .......... 1
Pin Type ......................... 25XLE
Pin Material ..................... Carbide
Pin Stroke ...................... 0.187 in. (4.7 mm) maximum
Operating Temperature .......... 32° to 122°F (0° to 50°C)
Humidity ........................ 0% to 80%

Notes:
1) Weight listed includes 25XLE carbide pin and pin cartridge.
2) Length may slightly exceed dimension listed due to bend radius of marker cable and, if applicable, air line
3) Air consumption is dependent on the type of pin being used.
1.2.3 TMP4150 and TMP4155 Marking Heads

Weight \(^1\) ........................................8.7 lb. (3.9 kg) marking head, brackets, and cable

Dimensions (L x W x H) \(^2\) ..............9.89 x 5.12 x 4.96 in. (251 x 130 x 126 mm) with 25XL pin (w/o boot*)

........................................10.14 x 5.12 x 4.96 in. (258 x 130 x 126 mm) with 150S pin (w/o boot*)

Boot Material.....................................

**TMP4150**: Neoprene

**TMP4155**: Nitrile (synthetic rubber)

* Boot Dimension...........................5.33 in. (135 mm) diameter

X-axis Travel.................................2.0 in. (50 mm) maximum

Y-axis Travel.................................0.3 in. (7.6 mm) maximum

Number of Impact Pins.....................1

Pin Type ........................................25XL- or 150S-series

Pin Material ..................................Powered Metal or Carbide (25XL-series)

........................................Powered Metal or Carbide-tipped (150S-series)

Pin Stroke: 25XL-series pin........0.125 in. (3.1 mm) recommended; 0.5 in. (12.7 mm) maximum

150S-series pin...............0.125 in. (3.1 mm) recommended; 0.25 in. (6.35 mm) maximum

Air Consumption \(^3\)

At Idle ..............................0.04 SCFM maximum

While Marking ............................0.80 SCFM maximum

Operating Temperature...............32° to 122°F (0° to 50°C)

Humidity....................................0% to 80%

NEMA Rating..............................12 (I.P. 55)

Notes:

1) Weight listed includes 25XL carbide pin and pin cartridge; weight does not include any support tooling.

2) Dimensions without marker cable or air line.

   Length may slightly exceed dimension listed due to bend radius of marker cable and air line (if applicable).

3) Air consumption is dependent on the type of pin being used.
1.2.4 Filter/Regulator Unit

**TMP4100E**: The TMP4100E does not employ a filter/regulator unit. It uses an electric solenoid to drive the pin and an internal spring to assist pin return.

**TMP4100**: The filter/regulator unit includes a regulator with a coarse filter and a pressure gauge to control the drive air. The unit also includes a coalescing filter to remove finer particles. The drive air fires the pin from the cartridge.

**TMP4150, TMP4155**: The filter/regulator unit includes two regulators with pressure gauges to control the drive air and return air. The first regulator contains a filter to help remove contaminants from the supply air. The drive air fires the pin from the cartridge. The return air pushes the pin back into the cartridge.

- Temperature............................32° to 122°F (0° to 50°C)
- Operating Pressure..................120 psi (8.3 bars) maximum

1.2.5 Storage and Handling Requirements

Do not drop the containers.

- Shock ......................................75G/11ms half sine-wave
- Vibration..................................1.04G (2-200 Hz) random RMS

Store all containers in a dry, heated, non-condensing environment.

- Temperature.........................-4° to 113°F (-20° to 45°C)
- Humidity..............................5% to 95%

Store all containers away from splashing or sprayed moisture.
1.3 UNPACKING THE EQUIPMENT
This section provides guidelines for receiving and unpacking the TMP4100-Series marking equipment.

**CAUTION**
If your equipment arrives during cold weather, allow the components to warm up for several hours before opening the containers. Exposing the equipment to room temperatures may cause condensation in the units.

When your marking equipment arrives, check the shipping cartons for damaged corners, holes through the cardboard, or any other signs of damage. Ask the delivery service to note any damage to the containers on the delivery receipt. Save all packing materials in case you need to return any components.

1.3.1 Accounting For Equipment
Check the materials against the packing list. Note any discrepancies to your delivery service and request that they note the discrepancies on the delivery receipt. The marking equipment consists of:

- **TMP4100, TMP4100E**: Marking head with pre-attached pistol-grip handle
- **TMP4150, TMP4155**: Marking head with mounting plate.
- **Marker cable (pre-wired to head)**
- **TMP4100, TMP4150, TMP4155**: Filter/regulator unit
- **TMP4100, TMP4150, TMP4155**: Air line(s)

Additional components may be included with the marking equipment. Specific information for optional equipment may be provided in a separate installation manual. Specific information for custom equipment may be provided in a custom addendum.
1.3.2 Inspecting for Damage

Place the components on a table and inspect each one for damage. Report any damage to your delivery service immediately.

1. Inspect the marking head.
   ♦ Ensure the marking head is not dented or cracked.
   ♦ **TMP4100, TMP4100E**: Visually inspect the interior of the marking head for loose, disconnected, or broken components.
   ♦ **TMP4100, TMP4100E**: Visually inspect the front of the marking head for any debris that may restrict movement.
   ♦ **TMP4100, TMP4100E**: Inspect the pistol-grip handle and push-button for cracks and damage.
   ♦ **TMP4150, TMP4155**: Inspect the protective boot for tears, cuts, or damage and for security of attachment.

2. Inspect the impact pin and pin cartridge.
   ♦ Ensure the impact pin is not bent or broken.
   ♦ Ensure the pin cartridge is not cracked or broken.

3. Inspect the cable assemblies.
   ♦ Ensure the connectors are securely attached.
   ♦ Ensure the connectors are not damaged and the connector pins are not bent or broken.
   ♦ Ensure the electrical cables are not cut, frayed, or damaged.

4. Inspect the filter/regulator unit.
   ♦ **TMP4100, TMP4150, TMP4155**: Ensure the fitting threads are not damaged.
   ♦ **TMP4100, TMP4150, TMP4155**: Ensure the pressure gauge(s) and bowls are not cracked.

5. Inspect the air line(s).
   ♦ **TMP4100, TMP4150**: Ensure the air line(s) are not kinked, cracked, or damaged.

1.4 INSTALLATION REQUIREMENTS

**TMP4100, TMP4100E**: These marking heads are to be used as hand-held markers.

**TMP4150, TMP4155**: These marking heads are to be mounted on a tooling fixture. If the marker is to be incorporated into a machine or mounted on a tool stand, safeguards must be designed and implemented at the time of the installation with the other machinery.

If the marker includes custom equipment, refer to the custom Addendum for specific information.

The following items are required for proper installation of the marking head. It is the responsibility of the installing agency to ensure these requirements are implemented.
1.4.1 General
- **TMP4150, TMP4155**: A safety guard may be required to keep operators away from the moving marking head and impact pin.
- **TMP4150, TMP4155**: A part-present switch may be installed to allow a START PRINT only when a part is in marking position.
- Operators may need hearing protection depending on distance from the marker and the part to be marked.
- Operators may need eye protection while operating the marker.

1.4.2 Environmental Considerations
- **TMP4100, TMP4100E**: The marker should not be exposed to sprays, solvents, chemicals, or other contaminants.
- **TMP4150, TMP4155**: These markers may be exposed to light sprays, solvents, chemicals, or other contaminants.
- Do not operate the marker in an area where flammable mists or fumes are present.
- Certain chemicals may damage the exposed portion of the cartridge.

1.4.3 Marking Head
- The marking head should be visible from the controller. The standard marker cable is 4 m (13 ft.) long.
- **TMP4150, TMP4155**: Provisions should be made to allow vertical adjustments to the marking head, allowing the marker to be positioned closer to and further away from the part being marked.
- **TMP4150, TMP4155**: Provisions should be made to allow horizontal and lateral adjustments to the marking head, allowing the marker to be positioned along both the X-axis and the Y-axis.
- **TMP4150, TMP4155**: The marking head can be plumbed to receive internal air pressure. Positive air pressure within the marker will help prevent contaminants from entering the marking head cavity. **Never exceed an internal air pressure of 2.0 psi (0.13 bars) within the marking head.**
- The part to be marked must be solidly fixed into position.
- The marker must be solidly secured (or held) and must not move in relation to the part while marking.

1.4.4 Filter/Regulator Unit
**TMP4100E**: The TMP4100E does not use air pressure to drive the marking pin. The following section does not apply to the TMP4100E marker.

**TMP4100, TMP4150, TMP4155**: The filter/regulator unit inlet receives air pressure from the plant air source. The drive air outlet supplies air pressure to the marker to drive the marking pin out of the pin cartridge for marking. Return air pressure retracts, and holds, the pin in the cartridge. For TMP4100 markers, the marking head contains an internal regulator to control the return air. For TMP4150 and TMP4155 markers, the return air is controlled by a separate regulator on the filter/regulator unit.
- The filter unit should be installed within 12 ft. (3.6 m) of the marking head; 50 ft. (15 m) maximum.
- A pneumatic lockout valve (supplied by the customer) should be installed upstream of the filter unit.
- A pressure relief valve (supplied by the customer) should be installed upstream of the filter unit.
- The pressure relief valve must be set to a maximum pressure of 120 psi (8.3 bars).
- Do not connect the filter unit to air systems where compressors are lubricated with fire resistant fluids such as phosphate ester and di-ester types.
• If the supply air is extremely dirty, additional customer-supplied filters may be needed upstream of the filter unit.
• The filter unit must be located to allow servicing and draining without damaging other equipment.
• Do not install the filter unit in an area subject to direct sunlight, impact blows, or extreme temperatures.
• Do not install the filter unit where it will be exposed to aldehydes, keytones, alcohol, or hot water.
• Install the regulator so the air flows in the direction of the arrow on the body of the filter unit.
• The filter unit bowls must be mounted vertically with the bowl drains at the bottom to permit draining.
• Each port of the filter unit must be plumbed (e.g., pressure gauge, line fitting, socket pipe plug).
• The customer-furnished supply line to the filter unit should be 1/2-in. (13 mm) inside diameter.
• The filter unit requires a 1/4-in. (6 mm) NPT supply air inlet fitting (supplied by customer).
• Apply a minimal amount of pipe joint compound to the male threads (only) to seal the pipe joints.
• Do not use Teflon® tape to seal the pipe joints. Do not apply pipe joint compound to female threads.

1.4.5 Facility (Supply) Air

TMP4100E: The TMP4100E does not use air pressure to drive the marking pin. The following section does not apply to the TMP4100E marker.

TMP4100, TMP4150, TMP4155: The marking head requires a clean, dry air supply to drive the impact pin. In most cases, plant air is acceptable. The following guidelines should help you decide if your air supply is suitable for use with the marker.

Condensation. The process of compressing air creates heat. The compressed air cools as it travels through the lines away from the compressor. The cooling process causes any moisture in the air to condense. Condensation is common in hot climates or when air lines are routed outside during cold weather. Condensation creates problems in the air valves and small openings within the marking head. Because you can never remove all the contaminate from an air line, a filtering system should be installed as close to the marker as possible. This reduces the opportunity for moisture in the supply air to condense.

Filtering. The least expensive way to filter the air is to use a coalescing filter. This type of filter causes a cyclone effect. Swirling air and the resulting centrifugal force throws the oil and moisture particles to the outside. There it condenses on a wall and runs down to the bottom of the bowl in the less turbulent, quiet area. The coalescing filter removes solid particles (down to 0.3 microns). If the collection of contaminants becomes too great, particles can be picked up and placed in suspension in the air. Therefore, Telesis recommends an automatic drain on the coalescing filter. In addition to aerosol particles, the air may contain dust, dirt, and metal shavings. If the air is very dirty, a pre-filter can be used to remove the larger (5 micron) particulate matter.

Air Flow. The cyclone effect (see above) cannot occur if there is little or no flow of air. Telesis markers use much less air at idle than when marking. So it’s during the idle time that the aerosol particles have a chance to cool and condense on the walls of the cartridge and pin. Most filter manufacturers recommend a minimum air flow of 20% of the maximum rated flow for their equipment to be effective. This is not a problem during marking because the rate of air consumption is relatively high. A controlled orifice opening (open to the air) can be constructed to keep the flow during idle at or above 20% of the flow rate. The controlled orifice should be located as close as possible to the marking head.
**Plumbing Factors.** Another practice for obtaining clean, dry air is to ensure the equipment is not at the end of the air line. Plumb the air supply to go up (vertically) off the main air supply line, then down to the top of a tee. The stem of the tee should be horizontal and go to the marker. The bottom of the tee should be a short stub with a drain valve or drip leg.

**Parameters.** The following parameters are easily achievable with a pre-filter and most coalescing filters.

- Humidity non-condensing
- 99.97% of the sub-micron particles removed
- 0.75 micron largest aerosol particle
- 0.30 micron largest solid particle
- 40° to 120°F (4.4° to 48.9°C)
- 5 micron pre-filter with an auto drain.

**Practices.** Follow these practices when installing and operating the marker to improve the quality of the air and increase the reliability of your marking equipment.

- Install the filter as close as possible to the marking head, never more than 50 ft. (15 m)
- Use Polyflo® tubing downstream of filter with brass or plated fittings
- Use copper, brass or stainless tubing upstream of the filter
- Do not use iron pipe or iron fittings.
- Do not use Teflon® tape
- Liquid Teflon® is permissible except:
  - on poly-carbonate plastic threaded holes
  - on the first thread of male fittings
- Blow down the air system after installation and before use (at least two minutes at full flow).
- Use a top tap off the main line with a drip leg (see Plumbing Factors).
- Do not use poly-carbonate bowls (they will crack when used with synthetic oils).
- Always use the largest available feed line and the shortest available run.
1.5 INSTALLATION PROCEDURES
Perform the following procedures (in the order listed) to install the marking equipment. See Figure 1-1 for a general arrangement illustration.

NOTE
It is the responsibility of the installing agency to ensure the installation requirements are correctly implemented.

![Diagram of TMP4100-Series Installation]

Figure 1-1. General Arrangement – TMP4100-Series Installation
1.5.1 Marking Head Installation

Refer to Figure 1-1 for general arrangement. For hand-held units, refer to Figure 1-2 for dimensions. For fixture-mounted units, refer to Figure 1-3 for mounting hole dimensions and locations.

TMP4100:
1. To allow the marker cable to reach the controller, ensure the marking head location is within 4m (13 ft.) of the proposed controller location.
2. Connect the drive air (black) tubing to the drive air fitting on the marking head.
3. Proceed with Filter/Regulator Unit Installation.

TMP4100E:
1. To allow the marker cable to reach the controller, ensure the marking head location is within 4m (13 ft.) of the proposed controller location.
2. Proceed to Controller Installation.

TMP4150, TMP4155: (optional – plumbing for internal air pressure)
The marking head can be plumbed to receive internal air pressure. Positive air pressure within the marker will help prevent contaminants from entering the marking head cavity.

Note: If the marking head will not be plumbed, proceed to TMP4150, TMP4155 Mounting Instructions.
1. Remove three socket head cap screws that attach mounting plate to marker top plate; remove mounting plate.
2. Remove marking head cover. Lift up on tabs of latches located on sides of marker. Rotate tabs counterclockwise to loosen and disengage latches. Slide protective boot over end of cartridge. Slide cover off marker.
3. Locate plug in top plate (adjacent to elbow fittings). Remove plug from top plate.
4. Locate set screw in top plate (adjacent to marker exhaust port). Remove set screw.
5. Fabricate positive pressure air fitting:
   a. Obtain one 90° elbow fitting (26964) and 1½" length of 6mm air tubing (26506).
   b. Install elbow fitting in top plate (where plug was removed). Install fitting such that 90° elbow is on inside of plate and oriented along edge of top plate and away from existing elbow fittings.
   c. Using a heat gun, heat one end of 6mm air tubing until pliable, then crimp closed.
   d. Insert open end of tubing into elbow fitting; seat completely.
   e. Drill one .012" orifice in exposed length of tubing. Rotate orifice toward back plate.
6. Install marking head cover. Slide cover over marker. Engage latches and rotate tabs clockwise to tighten. Push down on tabs so they lay flat against sides of marker. Slide protective boot up, onto cartridge.
7. Apply LOCTITE® 242 to three M6-1.0 x 12mm socket head cap screws. Use cap screws to attach mounting plate to top plate.

CAUTION

Never apply more than 2.0 psi (0.13 bars) air pressure to internal cavity of marking head.

8. Attach tubing from positive pressure air source to newly installed bulkhead fitting.
9. If the marker will operate in a wet environment, plumb the case vent to clean, dry air:
   a. Install one M-5AU-6 barbed fitting (30793) into threaded hole in mounting plate (above hole where set screw was removed from top plate and adjacent to marker exhaust port).
   b. Attach sufficient length of air tubing (26506) to barbed fitting and route tubing to clean, dry air.
Perform the following procedures to mount the TMP4150 and TMP4155 marking heads onto a standard Telesis tool stand or onto a customer-supplied fixture, as applicable.

**Telesis Tool Stand P/N 27200**
Note: Mounting hardware for the marking head is supplied in the standard tool stand kit (26208).

1. To allow the marker cable to reach the controller, ensure the marking head location is within 4m (13 ft.) of the proposed controller location.
2. Locate the two threaded holes in the mounting plate attached to the marker. Refer to Figure 1-3 for mounting hole dimensions and locations.
3. Align these holes with the lowest two holes on the tool stand carriage.
4. Using two ½-13 x 1.25-in. hex head bolts (15294) and two ½-in. AN960-816 flat washers (11445), mount the marker to the tool stand carriage. (Bolts insert from behind the carriage.) Tighten securely.
5. Connect the drive air (black) tubing to the drive air fitting on the marking head (marked “D”).
6. Connect the return air (natural) tubing to the return air fitting on the marking head (marked “R”).
7. Proceed with Filter/Regulator Unit Installation.

**Customer-Supplied Fixture**
Note: Mounting hardware for customer-supplied fixtures is not provided.

1. To allow the marker cable to reach the controller, ensure the marking head location is within 4m (13 ft.) of the proposed controller location.
2. Locate the four through holes near the corners of the mounting plate attached to the marker. Refer to Figure 1-3 for mounting hole dimensions and locations.
3. Using four ¼-in. (or 6 mm) bolts, four flat washers, four lock washers, and four hex nuts, attach the marker to the fixture. Tighten securely.
4. Connect the drive air (black) tubing to the drive air fitting on the marking head (marked “D”).
5. Connect the return air (natural) tubing to the return air fitting on the marking head (marked “R”).
6. Proceed with Filter/Regulator Unit Installation.
Figure 1-2. TMP4100 and TMP4100E Dimensions

NOTE: THESE DIMENSIONS ARE +1.00" AND −.025" (BELT TENSION ADJUSTMENTS). MAKE ALLOWANCES FOR ADJUSTMENT IN THE LONG AXE OF THE MARKER.
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Figure 1-3. TMP4150 and TMP4155 Mounting Details
1.5.2 Filter/Regulator Unit Installation

**TMP4100E:** The TMP4100E does not use air pressure to drive the marking pin. The following section does not apply to the TMP4100E marker.

**TMP4100, TMP4150, TMP4155:**
1. To allow the air lines to reach the marking head, ensure the filter/regulator mounting location is within 12 ft. (3.6m) of the marker location.
2. Refer to the Original Equipment Manufacturer (OEM) drawing for filter/regulator unit mounting details.
3. Rotate the drive air pressure adjustment knob fully counter-clockwise.
4. **TMP4150, TMP4155:** Rotate the return air pressure adjustment knob fully counter-clockwise.
5. Mount the filter/regulator unit vertically to a solid, stable surface.
6. Secure the filter/regulator unit using four M4 (#8) fasteners.
7. **TMP4100:** Connect the drive air (black) from the marking head to the filter/regulator unit.
8. **TMP4150, TMP4155:** Connect the drive air (black) from the marking head to the filter/regulator unit.
   Note: The Drive Air fitting on the filter/regulator unit is the tee fitting between the two regulators.
9. **TMP4150, TMP4155:** Connect return air (natural) tubing from the marking head to the filter/regulator unit.
   Note: The Return Air fitting on the filter/regulator unit is the elbow fitting at the right side of the unit.
10. Install a supply inlet fitting in the left-side of the filter/regulator unit.
11. Ensure the supply air is shut off upstream of the filter/regulator unit.
12. Connect the supply air line to the filter/regulator unit inlet fitting.
   **DO NOT apply inlet (supply) air pressure to the filter/regulator unit at this time.**
13. Proceed with *Controller Installation.*
1.5.3 Controller Installation
Refer to the Controller Installation/Maintenance Manual that was supplied with your marking system for the following procedures.
1. Install the marking system controller.
2. Perform the electrical and data connections.
3. Perform the controller checkout.
4. Proceed with Installation Adjustments.

1.5.4 Auxiliary Axis Equipment
If the marker includes optional Z-axis (vertical axis) or Theta-axis (rotational axis) components, refer to the Auxiliary Axis Installation Supplement that was supplied with the optional equipment for specific installation instructions.

1.5.5 Installation Adjustments
After all marking equipment is installed, you will need to adjust the system to prepare it for use.
1. Turn the controller ON.
2. Start the marking system software.
   Refer to the marking system Operation Manual (supplied with your system) for details.
3. Adjust the following as required.
   Refer to the Operation Supplement (supplied with your system) for details.
   ♦ TMP4100, TMP4150, TMP4155: Adjust the drive air pressure
   ♦ TMP4150, TMP4155: Adjust the return air pressure
   ♦ TMP4150, TMP4155: Adjust the pin stroke
   ♦ Adjust the marking depth
Section 2
Maintenance

2.1 OVERVIEW
This section provides troubleshooting, testing, repair, and replacement procedures for the marking head. Any additional troubleshooting, fault isolation, servicing, maintenance, or repair of TMP4100-Series marking head that is not explicitly contained in this document must be performed by repair agencies authorized by Telesis Technologies, Inc.

2.2 MAINTENANCE PRECAUTIONS
1. Turn all power OFF when performing maintenance on the marker.
2. Ensure that all equipment energy sources are turned off or disconnected and that the switches/valves are either locked or tagged while equipment is cleaned or serviced.
3. **TMP4100, TMP4150, TMP4155:** Ensure that appropriate pneumatic lock-out valves are installed.

2.3 ADJUSTMENT PROCEDURES
Periodically, you may need to make certain adjustments to keep your system operating at peak performance. Procedures for adjusting the system air pressure, the pin stroke, and the marking depth of the impact pin are located in the *TMP4100 Operation Supplement* or the *TMP4150 Operation Supplement* (supplied with the marking system).
2.4 CLEANING PROCEDURES
The following information is provided to clean the various marking head components.

2.4.1 Filter/Regulator Bowls
TMP4100E: The TMP4100E does not use a filter/regulator unit. The following section does not apply to the TMP4100E marker.

TMP4100, TMP4150, TMP4155: Perform the following procedure when cleaning is necessary. See Figure 2-1.

![Figure 2-1. Cleaning the Filter/Regulator Bowl]

1. Record the drive air pressure as indicated on the filter/regulator gauge.
2. **TMP4150, TMP4155**: Record the return air pressure as indicated on the filter/regulator gauge.
3. Turn off the facility supply (input) air to the filter/regulator unit.
4. Relieve the drive air pressure. Rotate the drive air pressure control knob fully counterclockwise.
5. **TMP4150, TMP4155**: Relieve the return air pressure. Rotate the return air pressure control knob fully counterclockwise.
6. Unscrew the bowl from body of the unit.
7. Remove the diaphragm/needle assembly from the inside (bottom) of the bowl. Be very careful not to damage the fine tip on the needle valve.
8. Clean the bowl with mild soap and water only. Carefully clean the diaphragm/needle assembly.
9. Dry the cleaned bowl thoroughly.
10. Place the diaphragm/needle assembly into the bowl.
    a. Center the needle in the small opening at the bottom of the bowl. The diaphragm/needle assembly should sit squarely in the base of the bowl.
    b. Ensure the diaphragm is seated in the bowl. Be very careful not to damage the fine tip on the needle valve.
11. Screw the bowl onto the body of the unit. Tighten the bowl securely (by hand) but do not over tighten.
12. Turn on the facility supply (input) air.
13. Adjust the air pressure(s) to the previously recorded settings.
2.4.2 Impact Pin / Pin Cartridge
Perform the following steps to clean the pin cartridge and impact pin.
1. Remove the impact pin / pin cartridge from the marking head.  (see replacement procedure)
2. Clean the cartridge using isopropyl alcohol or dish washing detergent and water.
The pins may be cleaned with solvent as long as they are wiped off completely and allowed to dry before being placed back into the cartridge.
   Do not use any petroleum-based solvent, paint thinners, or acetone.
   Do not use any oil for lubrication.
3. Install the impact pin / pin cartridge onto the marking head.  (see replacement procedure)

2.4.3 Marking Head Rail
Perform the following steps to clean the carriage rail in the marking head.
1. Remove electrical power from the marking system.
2. **TMP4100, TMP4150, TMP4155:** Remove air pressure from the marking system.
3. Remove the marking head cover.
   **TMP4150, TMP4155:**
   a. Lift up on the tabs of the latches located on the sides of the marker.
   b. Rotate the tabs counter-clockwise to loosen and disengage the latches.
   c. Slide the protective boot over the end of the cartridge.
   d. Slide the cover off the marker.
   **TMP4100, TMP4100E:**
   a. Using a 2.5mm hex key, remove four screws securing right cover to left cover.
   b. Remove the two screws from the end of the standoff (nearest the foot pad).
   c. Separate covers and place right cover aside.
4. Moisten a clean, lint-free, soft cloth with isopropyl alcohol.
5. Carefully wipe any dirt or debris from the rail.
6. Apply a light coat of oil (e.g., 3-IN-1® oil) to the rail.
7. Install the marking head cover:
   **TMP4100, TMP4100E:**
   a. Align right cover with left cover and secure with four screws.
   b. Install two screws in end of the standoff (nearest the foot pad).
   **TMP4150, TMP4155:**
   a. Slide the cover over the marker.
   b. Engage the latches and rotate the tabs clockwise to tighten.
   c. Push down on the tabs (so they lay flat against the sides of the marker).
   d. Slide the protective boot up, onto the cartridge.
2.5 TROUBLESHOOTING

This section provides troubleshooting information for the marking head. Refer to Table 2-1 to identify problems, their probable causes, and corrective action. If a defective component has been identified, refer to appropriate maintenance instructions to repair or replace the component. If these procedures fail to correct the problem, contact Telesis Customer Support.

Table 2-1. Troubleshooting the Marking Head

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marker will not move</td>
<td>1. Ensure the marking head cable is securely connected to the marking head and to the controller. Check cable. If defective, replace as required.</td>
</tr>
<tr>
<td></td>
<td>2. Ensure the controller is energized. Refer to the Controller Installation/Maintenance Manual.</td>
</tr>
<tr>
<td></td>
<td>3. Check the pin cartridge for a dragging pin or a hung-up pin.</td>
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<tr>
<td></td>
<td>4. Using the marking system software, place the marker Online.</td>
</tr>
<tr>
<td></td>
<td>5. Ensure the marker isn’t stalled. Using the marking system software, Reset the marker.</td>
</tr>
<tr>
<td></td>
<td>6. Using the marking system software, Jog the marker to move the marking head.</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION</strong></td>
</tr>
<tr>
<td></td>
<td>Do not connect or disconnect the marker cable while the controller power is ON. Turn power off before connecting/disconnecting the cable.</td>
</tr>
<tr>
<td></td>
<td>7. Disconnect marker cable from controller.</td>
</tr>
<tr>
<td></td>
<td>8. Test the marker extension cable(s). Replace if defective.</td>
</tr>
<tr>
<td></td>
<td>9. Test the marker cable. If defective, contact an authorized maintenance agency for repair.</td>
</tr>
<tr>
<td>Marking pin does not fire</td>
<td>1. <strong>TMP4100, TMP4150, TMP4155:</strong> Check the supply air and drive air regulator.</td>
</tr>
<tr>
<td></td>
<td>2. <strong>TMP4150, TMP4155:</strong> Check the return air regulator</td>
</tr>
<tr>
<td></td>
<td>3. <strong>TMP4100, TMP4150, TMP4155:</strong> Ensure the air lines are not crimped or broken. Replace as required.</td>
</tr>
<tr>
<td></td>
<td>4. <strong>TMP4100, TMP4150, TMP4155:</strong> Verify the filter is not clogged.</td>
</tr>
<tr>
<td></td>
<td>5. Ensure the pin is not binding in the pin cartridge. Clean or replace as necessary.</td>
</tr>
<tr>
<td></td>
<td>6. Using the marking system software, pulse the marking pin.</td>
</tr>
<tr>
<td></td>
<td>7. If the solenoid valve makes a clicking noise when pulsed, replace the solenoid valve.</td>
</tr>
<tr>
<td></td>
<td>8. Disconnect marker cable from controller and check solenoid resistance at the marker cable connector. Replace solenoid if defective.</td>
</tr>
</tbody>
</table>

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Table 2-1. Troubleshooting the Marking Head (continued)

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| Marking pin fires but does not mark | 1. Ensure the pin stroke does not exceed its maximum limit. Reduce the distance between the retracted pin and the marking surface as required.  
2. Ensure the pin is not binding in the pin cartridge. Clean or replace as necessary.  
3. **TMP4100, TMP4150, TMP4155:** Ensure the drive air is at least 70 psi (4.8 bars).  
4. **TMP4150, TMP4155:** Ensure the return air is not set too high.  
5. **TMP4100, TMP4150, TMP4155:** Ensure the air lines are not crimped or broken. Replace as required.  
6. **TMP4100, TMP4150, TMP4155:** Ensure the filter is not clogged. Clean as necessary.  
7. Using the marking system software, display the Marker Properties and ensure the Marking Speed and Pin Type parameters are set properly. |
| Poor marking performance | 1. If the marker was performing properly in previous marks, check the fixturing of the part. Poor marks may be caused by the marker having been moved or by part-fixturing problems.  
2. **TMP4100, TMP4150, TMP4155:** Ensure the drive air is at least 70 psi (4.8 bars).  
3. **TMP4150, TMP4155:** Ensure the return air is properly adjusted.  
4. Ensure the pin cartridge bore is not worn. Replace if necessary  
5. Ensure the pin is not binding in the pin cartridge. Clean or replace as necessary.  
6. Ensure the pin cartridge movement is not restricted in either axis.  
7. Using the marking system software, display the Marker Properties and reduce the Marking Speed parameter setting, as required. |
| Marker will not respond to external I/O (Host, Discrete I/O, or TTL Input) | 1. Ensure the marking head cable is securely connected to the marking head and to the controller.  
2. Ensure the controller is energized. Refer to the **Controller Installation/Maintenance Manual.**  
3. Using the marking system software, place the marker Online.  
4. Check for a Serial Communications fault, Discrete I/O fault, or TTL Input fault, as applicable. Refer to the **Controller Installation/Maintenance Manual.** |
| Marker starts marking in an unexpected location | 1. Using the marking system software, view the pattern object definition(s).  
2. Adjust the X/Y Anchor parameters and/or Justification parameter settings, as required. |

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### Table 2-1. Troubleshooting the Marking Head (continued)

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| Marker sounds as if motors are running, but no motion in one or both axes | **CAUTION**  
Do not connect or disconnect the marker cable while the controller power is ON. Turn power off before connecting/disconnecting the cable.  
1. Disconnect marker cable from controller.  
2. **TMP4100, TMP4150, TMP4155:** Remove air pressure from the marking system.  
3. Remove marking head cover.  
4. Ensure the carriage and/or the pin cartridge is not obstructed in either axis.  
5. Manually turn the X-axis pulley and check for slippage on the motor. If loose, contact an authorized maintenance agency for repair.  
6. Check stepper motor resistance. If out of tolerance, contact an authorized maintenance agency for repair. |
| Marker does not initialize when placed online; Marker does not move.      | 1. Ensure the marking head cable is securely connected to the marking head and to the controller.  
2. Ensure the controller is energized. Refer to the Controller Installation/Maintenance Manual.  
3. Using the marking system software, place the marker Online.  
4. Ensure the marker isn’t stalled. Using the marking system software, Reset the marker.  
**CAUTION**  
Do not connect or disconnect the marker cable while the controller power is ON. Turn power off before connecting/disconnecting the cable.  
5. Test the marker extension cable, if used. Replace if defective.  
6. Test the marker cable. If defective, contact an authorized maintenance agency for repair. |
| Marker does not initialize properly. Appears to be seeking home, but continues running after mechanical limits are reached. | 1. Ensure the carriage and/or the pin cartridge is not obstructed, preventing the drive mechanism from reaching the home position.  
**CAUTION**  
Do not connect or disconnect the marker cable while the controller power is ON. Turn power off before connecting/disconnecting the cable.  
2. Check marker extension cable, if used. Replace cable if defective.  
3. Check stepper motor resistance. If out of tolerance, contact an authorized maintenance agency for repair.  
4. **TMP4100, TMP4150, TMP4155:** Remove air pressure from the marking system.  
5. Remove marking head cover.  
6. Inspect the flag and sensor associated with the malfunctioning axis. The flag must pass between the opposed legs of the sensor. Ensure the sensor and flag are not cracked, broken or out of alignment. If defective, contact an authorized maintenance agency for repair. |

(Continued on next page)
### Table 2-1. Troubleshooting the Marking Head (continued)

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| **Message is cut off or truncated** | The message length may be too long to print within the marking window. Using the marking system software, edit the pattern object as required:  
1. Adjust the X/Y Anchor parameters to relocate the object within the window.  
2. Change the Justification parameter setting to reposition the object within the window.  
3. Decrease the Width or Pitch parameter (or both) as required.  
The pin may be hanging up in the cartridge, or the solenoid may not be operating.  
1. Using the marking system software, pulse the marking pin.  
2. Ensure the pin is not binding in the pin cartridge. Clean or replace as necessary. |
| **Marking is not properly oriented** | The object location may be improperly defined:  
1. Using the marking system software, view the pattern object definition(s).  
2. Adjust the X/Y Anchor parameters and/or Justification parameter settings, as required.  
A slip or stall may have occurred while marking due to an internal or external interference or obstruction.  
1. Using the marking system software, place the marker Online.  
2. Ensure the marker isn't stalled. Using the marking system software, reset the marker.  
3. If still not resolved, contact an authorized maintenance agency for repair. |
| **Mark too light** | 1. Ensure the hardness of the part being marked has not changed. Harder material may require adjustments to the pin stroke, the drive air pressure, or both.  
2. **TMP4100, TMP4150, TMP4155**: Ensure the drive air is at least 70 psi (4.8 bars).  
3. **TMP4150, TMP4155**: Ensure the return air is properly adjusted.  
4. **TMP4150, TMP4155**: Ensure the differential pressure between drive air and return air is sufficient. Try to maintain the largest possible differential pressure.  
5. **TMP4100, TMP4150, TMP4155**: Ensure the air lines are not crimped or broken. Replace as required.  
6. Ensure the pin is not binding in the pin cartridge. Clean or replace as necessary.  
7. **TMP4100, TMP4150, TMP4155**: Ensure the filter is not clogged. Clean as necessary.  
8. Adjust the pin stroke. Increase the distance between the retracted impact pin and the marking surface to increase the depth of mark.  
9. Ensure the impact pin is not dull or broken. Sharpen or replace as required.  
10. Check for a broken pin cartridge, or scarred mating surface. Replace as required.  
11. Using the marking system software, display the Marker Properties. Ensure the Pin Type parameter is set for the type of pin installed in the marker. |

(Continued on next page)
Table 2-1. Troubleshooting the Marking Head (continued)

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact depth is insufficient or inconsistent</td>
<td>1. Ensure the impact pin is not dull or broken. Sharpen or replace as required.</td>
</tr>
<tr>
<td></td>
<td>2. Ensure the pin cartridge bore is not worn. Replace if necessary</td>
</tr>
<tr>
<td></td>
<td>3. <strong>TMP4100, TMP4150, TMP4155</strong>: Ensure the drive air pressure is properly adjusted.</td>
</tr>
<tr>
<td></td>
<td>4. <strong>TMP4150, TMP4155</strong>: Ensure the air pressure is properly adjusted.</td>
</tr>
<tr>
<td></td>
<td>5. Using the marking system software, display the Marker Properties. Ensure the Pin Type parameter is set for the type of pin installed in the marker.</td>
</tr>
<tr>
<td></td>
<td>6. The marker may be moving faster than the pin can fire. Using the marking system software, display the Marker Properties and reduce the Marking Speed parameter setting, as required.</td>
</tr>
<tr>
<td>The accuracy of character formation is poor</td>
<td>• The marker speed may be too fast, requiring additional settling time. Using the marking system software, display the Marker Properties and reduce the Marking Speed parameter setting, as required.</td>
</tr>
<tr>
<td>The marked characters are grouped in intervals. Gaps exist between character intervals or characters are overlapped.</td>
<td>The cartridge base/frame mechanism may be mechanically locked up. 1. Inspect the rail to determine if they are free.</td>
</tr>
<tr>
<td></td>
<td>2. Clean rail and apply light oil (3-in-1).</td>
</tr>
<tr>
<td></td>
<td>3. If the rail/carriage is worn and causing binding, replace the marking head.</td>
</tr>
<tr>
<td></td>
<td>The impact pin may be sticking into the target material.</td>
</tr>
<tr>
<td></td>
<td>1. Verify the right pin type is selected for your marker.</td>
</tr>
<tr>
<td></td>
<td>2. <strong>TMP4100, TMP4150, TMP4155</strong>: Drive Air should be a minimum of 70 psi (4.8 bars).</td>
</tr>
<tr>
<td></td>
<td>3. Reduce the angle of the conical impact pin tip to prevent sticking and a faster withdrawal from the target material.</td>
</tr>
<tr>
<td>The indentation depth or diameter is too large for the character size</td>
<td>1. <strong>TMP4150, TMP4155</strong>: Reduce the Pin Stroke distance to reduce the depth and diameter.</td>
</tr>
<tr>
<td></td>
<td>2. <strong>TMP4100, TMP4150, TMP4155</strong>: Reduce the Drive Air pressure as required.</td>
</tr>
<tr>
<td></td>
<td>3. Pin angle may be too shallow. Install a sharper pin.</td>
</tr>
<tr>
<td>The indentation depth is inconsistent.</td>
<td>1. <strong>TMP4100, TMP4150, TMP4155</strong>: The Drive Air tubing to the marking head may be undersized causing restricted air flow. The Drive Air supplying the regulators should be no less than 1/2” and the tubing supplying the marker should be 6mm minimum and not exceed 50 ft. (15 meters).</td>
</tr>
<tr>
<td></td>
<td>2. <strong>TMP4100, TMP4150, TMP4155</strong>: The Drive Air tube may be restricted causing decreased flow to the valves, or plugged exhaust port. Ensure the filter is not clogged or dirty. Clean as necessary. Check the Drive Air tubing from the regulator to the marking head, and inside the marker, for crimped air lines or restrictions.</td>
</tr>
<tr>
<td></td>
<td>3. <strong>TMP4100, TMP4150, TMP4155</strong>: The Drive Air pressure regulator may be defective. Verify that the outlet air pressure is regulating properly. Replace if pressure variations of more than 5 psi (0.3 bars) are common.</td>
</tr>
<tr>
<td></td>
<td>4. <strong>TMP4100, TMP4150, TMP4155</strong>: The valve may be dirty or defective. Swapping the valve with a working valve.</td>
</tr>
</tbody>
</table>

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Table 2-1. Troubleshooting the Marking Head (continued)

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| Indentation depth is inconsistent in a particular area of the marking window. | 1. **TMP4100, TMP4150, TMP4155**: The coiled Drive Air tubing may be kinked or restricted when traversing. Inspect the tubing from the valve to the manifold for cracks, restrictions or crimps in the tubing.  
2. **TMP4100, TMP4150, TMP4155**: Loose or incorrectly mounted head cartridge. Check for a loose cartridge, leaking air, or a cartridge mounted incorrectly.  
3. **TMP4100, TMP4150, TMP4155**: Worn cartridge, or excessive dirt/oil in the Drive Air making the pin stick. Inspect the pin cartridge for excessive "blow by" air. Remove the cartridge, push the pin into the cartridge, and release it in a vertical position (pin down). The pin should drop freely. If not clean with isopropyl alcohol and try again. |
| The indentations within the characters are not placed accurately.       | • The marker or material to be marked may be moving relative to each other during the marking cycle. In order to assure a high quality mark, it is important that there is little or no relative movement between the marker and material being marked. |
| The marked characters are wholly or partially garbled or skewed.        | 1. **TMP4100, TMP4150, TMP4155**: The incorrect pin type may be entered, causing a slip. Sharper pins require slower marking speeds, and with softer material, may hang up in the product being marked. Verify that the correct operating parameters have been entered. On new installations, try a slower marking speed.  
2. A slip may have occurred while marking due to an interference. The material being marked may have raised portions which are being struck by either the impact pin or the cartridge. A "dry run" with the pin retracted may verify the possible interference.  
3. Excessive vibration of the marker in the plane of the marking surface, normal to the indentation forces, may have caused a slip. Due to the inherent nature of step motor driven systems, there is the possibility of exceeding the holding force of the motors with impulse forces caused by vibration. Ensure the mounting of the marker will not promote vibration in the same plane as the cartridge base/frame traversing components.  
4. If the cartridge base/frame mechanism does not fully travel to the Home position, it may reach the end of travel before the marking is complete. Verify that the full range of travel in both X and Y directions is achievable by jogging the unit to its extreme positions. If full travel is not possible, check the flag in that direction for proper location. Check for interference. Verify there is no internal binding of parts or tubing.  
5. The impact pin may be momentarily sticking into the target material, resulting in excessive drag and slip. The deeper that the impact pin penetrates the target material, the longer it takes to retract from the material. This is mostly due to the increased energy transfer into the target. |
| Marking time is too long                                                 | • The marker is supplied with the factory parameters set to provide the highest degree of quality and best practical speed for all font selections and resolutions. The parameter values may be changed, giving you the ability to customize the setting for your particular application.  
• In most cases, marking times will be reduced if you increase the marking speed. Using the marking system software, display the Marker Properties and adjust the marking speed parameter, as required, to increase the speed settings.  
• Marking times may also be reduced by decreasing the pixel density (using Continuous mode), changing the print mode (from Continuous mode to non-continuous, dot matrix mode), or changing the character font and/or character size.  
• Change the settings as required to better meet your needs, but ensure the quality of the resulting mark is acceptable. |
2.6 TESTING PROCEDURES
This section provides reference tables to check the circuitry for TMP4100-Series marking heads.

2.6.1 Stepper Motor Resistance
The following information is provided to check the resistance values of the stepper motor circuit.
1. Remove electrical power from the marking system.
2. **TMP4100, TMP4150, TMP4155**: Remove air pressure from the marking system.
3. Disconnect the marker cable from the controller.
4. Measure the resistance values for the stepper motor at the connector on the end of the marker cable. Refer to Table 2-2 for acceptable values.

<table>
<thead>
<tr>
<th>PIN-TO-PIN</th>
<th>DESCRIPTION</th>
<th>RESISTANCE VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TMP4100</td>
<td>TMP4100E</td>
</tr>
<tr>
<td>1 to 2</td>
<td>X-AXIS MOTOR PHASE A</td>
<td>2.0 ohms ±10%</td>
</tr>
<tr>
<td>3 to 4</td>
<td>X-AXIS MOTOR PHASE B</td>
<td>2.0 ohms ±10%</td>
</tr>
<tr>
<td>5 to 6</td>
<td>Y-AXIS MOTOR PHASE A</td>
<td>2.0 ohms ±10%</td>
</tr>
<tr>
<td>7 to 8</td>
<td>Y-AXIS MOTOR PHASE B</td>
<td>2.0 ohms ±10%</td>
</tr>
</tbody>
</table>

2.6.2 Solenoid Resistance
The following information is provided to check the resistance values of the solenoid circuit.
1. Remove electrical power from the marking system.
2. **TMP4100, TMP4150, TMP4155**: Remove air pressure from the marking system.
3. Disconnect the marker cable from the controller.
4. Measure the resistance values for the solenoid at the connector on the end of the marker cable. Refer to Table 2-3 for acceptable values.

<table>
<thead>
<tr>
<th>PIN-TO-PIN</th>
<th>DESCRIPTION</th>
<th>RESISTANCE VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SOLENOID #1</td>
<td></td>
</tr>
<tr>
<td>9 to 12</td>
<td></td>
<td>12 ohms ±5%</td>
</tr>
</tbody>
</table>
### 2.6.3 Extension Cable Continuity

The following information is provided to check the continuity of the marking head extension cable, if used. The cable connects between the TMP4100-Series marker cable and the controller.

1. Remove electrical power from the marking system.
2. **TMP4100, TMP4150, TMP4155:** Remove air pressure from the marking system.
3. Disconnect the extension cable from the marker cable.
4. Disconnect the extension cable from the controller.
5. Check the pin-to-pin continuity of the extension cable. Refer to Table 2-4 for pin numbers and signal information.

#### Table 2-4. Marking Head Extension Cable Pin Assignments

<table>
<thead>
<tr>
<th>FROM J1</th>
<th>TO J2</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>X MOTOR PHASE 1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>X MOTOR PHASE 2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>X MOTOR PHASE 3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>X MOTOR PHASE 4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Y MOTOR PHASE 1</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>Y MOTOR PHASE 2</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Y MOTOR PHASE 3</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Y MOTOR PHASE 4</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>SOLENOID COMMON</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>SOLENOID COMMON</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>SOLENOID #1 (Impact Pin, TMP4100-Series markers)</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>SOLENOID #2 (Impact Pin, TMP4100E only)</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>SOLENOID #3 (Impact Pin, TMP4100E only)</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>SOLENOID #4 [not used w/ standard TMP4100-Series markers]</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>SOLENOID #5 [not used w/ standard TMP4100-Series markers]</td>
</tr>
<tr>
<td>17</td>
<td>17</td>
<td>SOLENOID #6 [not used w/ standard TMP4100-Series markers]</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>+5 VDC RETURN</td>
</tr>
<tr>
<td>21</td>
<td>21</td>
<td>+5 VDC</td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td>X HOME</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
<td>Y HOME</td>
</tr>
<tr>
<td>28</td>
<td>28</td>
<td>START PRINT – (+5 VDC RETURN)</td>
</tr>
<tr>
<td>29</td>
<td>29</td>
<td>START PRINT +</td>
</tr>
<tr>
<td>37</td>
<td>37</td>
<td>CHASSIS GROUND</td>
</tr>
</tbody>
</table>
2.7 REPAIR PROCEDURES
Authorized repair of the TMP4100-Series marking head is limited to impact pin reconditioning. Any other repair of the marking head must be performed by repair agencies authorized by Telesis Technologies, Inc.

2.7.1 Impact Pin Reconditioning
Pin life depends largely on the type of material being marked, how hard or abrasive it is, and the required marking depth. On typical metals with a hardness of Rockwell Rb47, marking at a depth of .127 mm (0.005 in.), powdered steel pins average about 3 million impressions before needing sharpened.

Periodically, the tips of the impact pins will become dull and require reconditioning. Grind (or replace) the impact pins on a regular basis to prevent dull pins from producing an unsatisfactory mark.

Pins should be reconditioned at the first sign of mark degradation or when the pin point becomes noticeably flattened. The length of service between reconditioning will depend on the pin material, the material being marked and the depth of the mark desired. Table 2-5 lists the lengths for new and reconditioned pins. The pin cone angle and length are illustrated in Figure 2-2.

<table>
<thead>
<tr>
<th>PIN TYPE</th>
<th>MARKING HEAD</th>
<th>NEW LENGTH</th>
<th>MINIMUM LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>25L</td>
<td>TMP4100, TMP4150, TMP4155</td>
<td>2.18 in. (55.4 mm)</td>
<td>2.12 in. (53.8 mm)</td>
</tr>
<tr>
<td>150S</td>
<td>TMP4100, TMP4150, TMP4155</td>
<td>2.75 in. (69.9 mm)</td>
<td>2.68 in. (68.1 mm)</td>
</tr>
<tr>
<td>25XLE</td>
<td>TMP4100E only</td>
<td>1.77 in. (45.0 mm)</td>
<td>1.70 in. (43.2 mm)</td>
</tr>
</tbody>
</table>

Figure 2-2. Pin Cone Angle and Length
The recommended grinding wheels for the various pin material are listed below. The minimum pin lengths allow for only about a 3% reduction in the total length during reconditioning. Therefore, only the smallest amount of material necessary to obtain a sharp point should be removed. Several small “cuts” should be taken, instead of larger ones, to avoid removing more material than necessary and to avoid overheating the pin.

<table>
<thead>
<tr>
<th>PIN MATERIAL</th>
<th>GRINDING WHEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPOSITE METAL</td>
<td>ALUMINUM OXIDE (PINK 12A, BEST)</td>
</tr>
<tr>
<td>TUNGSTEN CARBIDE</td>
<td>SILICONE CARBIDE (GREEN 39C)</td>
</tr>
</tbody>
</table>

**WARNING**

Read the Material Safety Data Sheets (MSDS) sheets, included in the Appendix of this document, prior to reconditioning pins to become familiar with reconditioning hazards.

Always wear a respirator, safety glasses, and gloves when grinding metal.

**CAUTION**

Use the appropriate precautions, coolant, and abrasive for the pin material and the grinding techniques described in the MSDS.

The following will assure properly reconditioned pins:

1. Remove the impact pin / pin cartridge from the marking head. (see replacement procedure)
2. Mount the pin in the fixture, making sure that the pin is supported near its point. This fixture must be capable of rotating the pin during the grinding operation.
3. Use the proper abrasive wheel for the pin material.
4. Coolant should be used.
5. Keep the abrasive wheel dressed for a straight conical-shaped point on the pin.
6. Set the fixture to obtain the desired pin cone angle.
7. Grind the pin to a sharp point, while continually rotating the pin.
8. Make several light “cuts” to reduce chatter and keep the pin cool. This reduces pin material waste.
9. Install the impact pin / pin cartridge onto the marking head. (see replacement procedure)
2.8 REPLACEMENT PROCEDURES
Authorized replacement of the TMP4100-Series marking head components are listed in the following paragraphs. Component replacement procedures not explicitly contained in this document must be performed by repair agencies authorized by Telesis Technologies, Inc.

2.8.1 Impact Pin / Pin Cartridge
Follow the steps below to remove and replace the impact pin and/or the pin cartridge assembly.

CAUTION
The impact pin and pin cartridge do not require lubrication.
The plastic pin cartridge may become obstructed if lubricated.

Removal
1. Remove electrical power from the marking system.
2. TMP4100, TMP4150, TMP4155: Remove air pressure from the marking system.
3. TMP4150, TMP4155: Remove the marking head cover:
   a. Lift up on the tabs of the latches located on the sides of the marker.
   b. Rotate the tabs counter-clockwise to loosen and disengage the latches.
   c. Slide the protective boot over the end of the cartridge.
   d. Slide the cover off the marker.
4. Remove two screws that secure the cartridge to the manifold.
5. Gently tip the pin cartridge allowing the impact pin to slide from the open cartridge bore.
6. TMP4100E: Remove the return spring from the pin cartridge.
7. If you are re-using the same cartridge, clean the cartridge bore with isopropyl alcohol. Use care to prevent contaminants from entering the bore.

Installation
1. TMP4100E: Install the return spring on the small diameter of the impact pin.
2. Insert the impact pin into the cartridge bore.
3. Apply VIBRA-TITE® to the two screws (removed from the cartridge). Allow the VIBRA-TITE® to dry before continuing.
4. TMP4100, TMP4150, TMP4155: Align the return air port (hole) of the pin cartridge with the hole in the manifold.
5. Press the cartridge into place and secure with the two screws. Tighten securely, but do not over tighten.
6. TMP4150, TMP4155: Install the marking head cover:
   a. Slide the cover off the marker.
   b. Engage the latches and rotate the tabs clockwise to tighten.
   c. Push down on the tabs (so they lay flat against the sides of the marker.
   d. Slide the protective boot up, onto the cartridge.
   Ensure the boot is positioned above the tabs on the cartridge.
2.8.2 Marker Standoff

**TMP4150, TMP4155:** The TMP4150 and TMP4155 do not use a marker standoff. The following section does not apply to the TMP4150 or TMP4155 markers.

**TMP4100, TMP4100E:** Perform the following procedure to replace the standoffs mounted on the front of the marking head.

---

**CAUTION**

Do not reposition the pin cartridge by hand. Internal components of the marking head may be damaged if improperly positioned. Use the system’s Jog feature or Online command to reposition the pin cartridge.

---

**Removal**

1. Place the marker online (or use the Jog feature) to move the pin cartridge to the left side of the marking window. Refer to the marking system *Operation Manual* for details on using the system software.

2. Using a 2mm hex key, remove the two M3-0.50 x 10 flat head screws from the right side standoff (side opposite the pin cartridge location) and remove the standoff.

**Installation**

1. Install the new standoff on the right side of the marker. Secure with two M3-0.50 x 10 flat head screws.

2. Use the Jog feature to move the pin cartridge to the right side of the marking window. Refer to the marking system *Operation Manual* for details on using the system software.

3. Using a 2mm hex key, remove the two M3-0.50 x 10 flat head screws from the left side standoff (side opposite the pin cartridge location) and remove the standoff.

4. Install the new standoff on the left side of the marker. Secure with two M3-0.50 x 10 flat head screws.
2.8.3 TMP4100 Solenoid Valve

Perform the following procedure to replace the TMP4100 solenoid valve.

Removal

1. Remove electrical power from the marking system.
2. Remove air pressure from the marking system.
3. Remove the standoffs. (see replacement procedure)
4. Using a 2.5mm hex key, remove four M3-0.50 x 25 screws securing right cover to left cover. Separate covers and place right cover aside.
5. Using a 2mm hex key, loosen set screw in handle holding the push button switch.
6. Remove switch connector J2 from the limit board.
7. Remove the switch assembly from the handle.
8. Using a 2.5mm hex key, loosen set screw securing the handle to the handle mount. Gently, pry and pull handle from the mount.
9. Using a 3mm hex key, remove two M4-0.70 x 16 socket head cap screws that secure the handle mount to the manifold base.
10. Remove the tubing from the bulkhead connector.
11. Remove cable connector J1 from the limit board and disconnect the ground lug.
12. Using a 2.5mm hex key, remove three flat head screws from the bottom of the left cover.
13. Remove the marking unit from the left cover and place left cover aside.
14. Remove the two solenoid wires lugs from J6 and J7 on the limit board.
15. Using a 1.5mm hex key, remove two socket head cap screws from the solenoid valve and remove the solenoid valve from the marking unit.
Installation

1. Install the new solenoid valve assembly. **Ensure the gasket is properly positioned.**
2. Route the solenoid wires toward the upper, backside of the X-axis motor and push the plugs onto limit board connectors J6 and J7.
3. Install the marking unit into left cover and secure with three flat head screws.
4. Connect the marking unit cable connector J2 to J1 on the limit board.
5. Attach the ground lug.
6. Connect tubing to bulkhead fitting. **Do not kink the tubing.**
7. Install the handle mount onto left cover (with radius end of handle toward the back of the marker). Secure with two M4-0.70 x 16 socket head cap screws.
8. Slide the handle onto the handle mount and tighten the set screw.
9. Install the push button switch assembly (connector end first) through the switch mounting hole.
10. Route the switch wires in and upward through the clearance hole toward the limit board.
11. Connect the switch wires to J2 on the limit board.
12. Secure the switch to the handle with a M3-0.50x3 set screw.
13. Lay the flex snap in the strain relief bushing on the cable assembly in the half-hole in the back of the left cover with the tab facing down into the half-hole.
14. While holding the bushing in place, lay the right cover on top. **Ensure the push button wires are not pinched between the covers.**
15. Secure the right cover with four M3-0.50 x 25 socket head cap screws.
16. Install the standoffs. (see replacement procedure)
2.8.4 TMP4100E Solenoid Valve

Perform the following procedure to replace the TMP4100E solenoid valve.

**Removal**

1. Remove electrical power from the marking system.
2. Remove the impact pin / pin cartridge from the marking head. (see replacement procedure)
3. Remove the standoffs. (see replacement procedure)
4. Using a 2.5mm hex key, remove four M3-0.50 x 25 screws securing right cover to left cover. Separate covers and place right cover aside.
5. Using a 2mm hex key, loosen set screw in handle holding the push button switch.
6. Remove switch connector J2 from the limit board.
7. Remove the switch assembly from the handle.
8. Using a 2.5mm hex key, loosen set screw securing the handle to the handle mount. Gently, pry and pull handle from the mount.
9. Using a 3mm hex key, remove two M4-0.70 x 16 socket head cap screws that secure the handle mount to the manifold base.
10. Remove cable connector J1 from the limit board and disconnect the ground lug.
11. Using a 2.5mm hex key, remove three flat head screws from the bottom of the left cover.
12. Remove the marking unit from the left cover and place left cover aside.
14. Remove two M3-.05 x 6mm flat head cap screws from the electric pin. Remove the armature and shim(s).
15. Rotate the solenoid over the end leg.
16. Remove two M3-.05 x 6mm flat head cap screws that secure the solenoid frame to the cartridge base.
17. Remove two nuts securing solenoid to the electric pin base.
18. Note wire routing and location of wire ties. Remove wire ties, as applicable, and remove solenoid.

**Installation**

1. Mount the solenoid to the electric pin base using the two nuts provided on the solenoid.
2. Thread the wires from the solenoid through the hole in the face of the cartridge base leaving about 1½ to 2 inches protruding from the face.
3. Place the solenoid frame on the face of the cartridge base with wires through the notches and on top. Align the screw holes and attach with two M3-.05 x 6mm flat head cap screws.
4. Rotate the solenoid over the end of the leg so that wires are on either side of the top leg. Push the assembly down between the legs, solenoid first.
5. Verify the armature and shim(s) are in place prior to securing the solenoid. Align the holes and attach with two M3-.05 x 6mm flat head cap screws.

Caution
Do not pull the wires through from the backside of the cartridge base. Doing so might strip insulation from the wires and short the solenoid drivers.

6. Push the wires from the front through the notches while taking up the slack from the back of the cartridge base until all slack is removed from the wires.

7. Route the wires down the side of the frame, opposite the cam, allowing enough wire with slight slack when the cartridge is at the cam side of the frame.

8. Place a wire tie around the frame and wires immediately ahead of the boss for the right side pulley (as viewed from the top). Place a second wire tie around wires and through the frame’s large rear hole.

9. Plug the wires into jacks J6 and J7.

10. Install the marking unit into left cover and secure with three flat head screws.

11. Connect the marking unit cable connector J2 to J1 on the limit board.

12. Attach the ground lug.

13. Install the handle mount onto left cover (with radius end of handle toward the back of the marker). Secure with two M4-0.70 x 16 socket head cap screws.

14. Slide the handle onto the handle mount and tighten the set screw.

15. Install the push button switch assembly (connector end first) through the switch mounting hole.

16. Route the switch wires in and upward through the clearance hole toward the limit board.

17. Connect the switch wires to J2 on the limit board.

18. Secure the switch to the handle with a M3-0.50x3 set screw.

19. Lay the flex snap in the strain relief bushing on the cable assembly in the half-hole in the back of the left cover with the tab facing down into the half-hole.

20. While holding the bushing in place, lay the right cover on top. Ensure the push button wires are not pinched between the covers.

21. Secure the right cover with four M3-0.50 x 25 socket head cap screws.

22. Install the impact pin / pin cartridge onto the marking head. (see replacement procedure)

23. Install the standoffs. (see replacement procedure)
2.8.5 TMP4150 and TMP4155 Solenoid Valve

Perform the following procedure to replace the TMP4150 or TMP4155 solenoid valve.

**Removal**

1. Remove electrical power from the marking system.
2. Remove air pressure from the marking system.
3. Remove the marking head cover:
   a. Lift up on the tabs of the latches located on the sides of the marker.
   b. Rotate the tabs counter-clockwise to loosen and disengage the latches.
   c. Slide the protective boot over the end of the cartridge.
   d. Slide the cover off the marker.
4. Remove the two solenoid wires lugs from J6 and J7 on the limit board.
5. Using a 1.5mm hex key, remove two socket head cap screws from the solenoid valve and remove the solenoid valve from the marking unit.

**Installation**

1. Install the new solenoid valve assembly. **Ensure the gasket is properly positioned.**
2. Route the solenoid wires toward the upper, backside of the X-axis motor and push the plugs onto limit board connectors J6 and J7.
3. Install the marking head cover:
   a. Slide the cover off the marker.
   b. Engage the latches and rotate the tabs clockwise to tighten.
   c. Push down on the tabs (so they lay flat against the sides of the marker).
   d. Slide the protective boot up, onto the cartridge.
2.9 REFERENCE DATA
The following information will assist you in obtaining components to maintain the marking head.

2.9.1 Replacement Parts
Refer to Table 2-6 for a list of replaceable components and their part numbers. Additional tables in this section list impact pins and pin cartridge assemblies that may be used with the TMP4100-Series markers.

Table 2-6. TMP4100-Series Replacement Parts

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>TMP4100</th>
<th>TMP4100E</th>
<th>TMP4150</th>
<th>TMP4155</th>
</tr>
</thead>
<tbody>
<tr>
<td>24176</td>
<td>Cable Assembly, Marker, 8 m (26 ft.) long, Extension</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>24682</td>
<td>Cable Assembly, Marker, 38 ft. (11.5 m) long, Extension</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>30306</td>
<td>Marker Assembly, TMP4100, Pneumatic</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38297</td>
<td>Marker Assembly, TMP4100E, Electric</td>
<td></td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38451</td>
<td>Marker Assembly, TMP4150</td>
<td></td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>44320</td>
<td>Marker Assembly, TMP4155</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>27278</td>
<td>Pneumatic Assembly, Filter/Regulator, Mini, Metric</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40826</td>
<td>Pneumatic Assembly, Filter/Regulator, Mini</td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>27339</td>
<td>Solenoid Valve</td>
<td></td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35014</td>
<td>Solenoid Valve</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>30953</td>
<td>Standoff, Marker</td>
<td></td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>30942</td>
<td>Standoff, Marker</td>
<td></td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>35084</td>
<td>Tubing Set, 6mm x 12 ft. (3.6 m), Black/Clear</td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>26506</td>
<td>Tubing, Poly, 6mm, Black, Legris</td>
<td></td>
<td></td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

Table 2-7. Cartridge Assemblies

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>TMP4100</th>
<th>TMP4100E</th>
<th>TMP4150</th>
<th>TMP4155</th>
</tr>
</thead>
<tbody>
<tr>
<td>37148</td>
<td>150S Cartridge Kit (impact pin not included)</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>37149</td>
<td>25XL Cartridge Kit (impact pin not included)</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>26862</td>
<td>25XLE Cartridge Kit (impact pin not included)</td>
<td></td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41150</td>
<td>25L Extended-Body Cartridge (impact pin not included)</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Table 2-8. Cartridge Compression Springs

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>TMP4100</th>
<th>TMP4100E</th>
<th>TMP4150</th>
<th>TMP4155</th>
</tr>
</thead>
<tbody>
<tr>
<td>26822</td>
<td>Compression Spring (Return Spring for 25XLE pin)</td>
<td></td>
<td></td>
<td>●</td>
<td></td>
</tr>
</tbody>
</table>

2-21
Change 1
### Table 2-9. Impact Pins

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>TMP4100</th>
<th>TMP4100E</th>
<th>TMP4150</th>
<th>TMP4155</th>
</tr>
</thead>
<tbody>
<tr>
<td>14060</td>
<td>Pin, Impact, 25XL, Carbide, 22°</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>14061</td>
<td>Pin, Impact, 25XL, Carbide, 30°</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>14062</td>
<td>Pin, Impact, 25XL, Carbide, 45°</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>17581</td>
<td>Pin, Impact, 25XL, Carbide, 60°</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>17461</td>
<td>Pin, Impact, 25XL, Carbide, 60° W/ Radius Tip</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>17459</td>
<td>Pin, Impact, 25XL, Powdered Steel, 22°</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>14053</td>
<td>Pin, Impact, 25XL, Powdered Steel, 30°</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>15059</td>
<td>Pin, Impact, 25XL, Powdered Steel, 45°</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>17460</td>
<td>Pin, Impact, 25XL, Powdered Steel, 60°, Radius Tip</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>16444</td>
<td>Pin, Impact, 150S, Powdered Steel, 30 °</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>16445</td>
<td>Pin, Impact, 150S, Powdered Steel, 45 °</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>17464</td>
<td>Pin, Impact, 150S, Powdered Steel, 60°, Radius Tip</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>26820</td>
<td>Pin, Impact, 25XLE, Carbide, 30 °</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26821</td>
<td>Pin, Impact, 25XLE, Carbide, 45 °</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.9.2 Ordering Parts
If you need parts for the marking system, be sure to specify the marking head model number and serial number when ordering.

2.9.3 Telesis Customer Support
Telesis Customer Support offers the following assistance.

Phone Support - Telesis Customer Support offers free phone support to answer questions during normal business hours.

On-Site Service - Telesis can send Customer Support professionals to your facility to perform equipment start-up, repair, maintenance, and training.

Service Contracts - As part of your Service Contract, you receive periodic maintenance and quick on-site customer support if a problem should occur.

Factory Service - Telesis Customer Support can repair defective parts in our factory to save you money.

Contact us for more information on any of these services.

Telesis Technologies, Inc.
P.O. Box 1000
Circleville, Ohio 43113
USA
Tel: ++1 (740) 477 5000
Fax: ++1 (740) 477 5001
E-mail: support@telesistech.com

Telesis Europe B.V.
Innsruckweg 104
3047 AH Rotterdam
The Netherlands
Tel: ++31 (0)10-462 21 36
Fax: ++31 (0)10-462 38 63
E-mail: telesis.europe@wxs.nl

Telesis MarkierSysteme GmbH
Wülflingstrasse 6
D-42477 Radevormwald
Germany
Tel: ++49 (0) 2191-60 90 8 0
Fax: ++49 (0) 2191-60 90 8 88
E-mail: info@telesistech.com

Telesis Systèmes de Marquage
BP 438
77 481 Provins Cedex
France
Tel: ++33 (0)1 60 67 12 96
Fax: ++33 (0)1 60 58 07 45
E-mail: gerbad@telesistech.com

Telesis Eagle
Colyton
Devon, UK EX24 6LU
Tel: ++44 (0) 1297 551313
Fax: ++44 (0) 1297 551319
E-mail: support@telesiseagle.co.uk
E-mail: sales@telesiseagle.co.uk
Appendix A
Material Safety Data Sheets

This Appendix contains Material Safety Data Sheets (MSDS) for carbide and steel impact pins. The impact pins are used by the TMP4100-Series marking heads for imprinting messages into various materials.

Read the MSDS sheets prior to reconditioning pins to become familiar with potential reconditioning hazards. Always wear a respirator, safety glasses, and gloves when grinding metal. Use the appropriate precautions, coolant, abrasive, and grinding techniques for the pin material as described in the Material Safety Data Sheets.
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MATERIAL SAFETY DATA SHEET
CARBIDE PINS

1. PRODUCT DEFINITION

CHEMICAL NAME: Cemented carbide product
TRADE NAME & SYNONYMS: All Carbide Grades

CHEMICAL FAMILY: Refactory Metal Carbide
MOLECULAR WEIGHT: Varies with grade

2. HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>CAS #</th>
<th>% BY WEIGHT***</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tungsten Carbide</td>
<td>12070-12-1</td>
<td>0 - 97%</td>
<td>5 mg/m3</td>
<td>5 mg/m3</td>
</tr>
<tr>
<td>(limits for water insoluble tungsten compounds)</td>
<td></td>
<td></td>
<td>10 mg/m3 STEL</td>
<td>10 mg/m3 STEL</td>
</tr>
<tr>
<td>Cobalt</td>
<td>7440-48-4</td>
<td>0 - 30%</td>
<td>0.05 mg/m3</td>
<td>0.05 mg/m3</td>
</tr>
<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>0 - 20%</td>
<td>1 mg/m3</td>
<td>1 mg/m3</td>
</tr>
<tr>
<td>Tantalum Carbide</td>
<td>12070-06-3</td>
<td>0 - 55%</td>
<td>5 mg/m3</td>
<td>5 mg/m3</td>
</tr>
<tr>
<td>(limits for tantalum metal dusts)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molybdenum</td>
<td>12069-89-5</td>
<td>0 - 15%</td>
<td>10 mg/m3***</td>
<td>10 mg/m3</td>
</tr>
<tr>
<td>(limits for insoluble molybdenum compounds)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromium Carbide((Cr_3C_2))</td>
<td>12012-35-0</td>
<td>0 - 5%</td>
<td>0.5 mg/m3</td>
<td>0.5 mg/m3</td>
</tr>
<tr>
<td>(limits for chromium III compounds, as (Cr))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This product contains substances which are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

During normal usage cemented carbide products do not present inhalation, ingestion or other chemical hazards of any kind. Wet or dry grinding of these products may release dusts of potentially hazardous ingredients which can be inhaled, swallowed, or come in contact with skin and eyes. During wet grind, the dust can be suspended or dissolved in the coolant mist.

3. PHYSICAL DATA

| Physical State:        | Solid         | pH: N/A       |
| Boiling Point:         | N/A*          | Specific Gravity (H₂O - 1): 5.0-15.0 |
| Freezing Point:        | N/A           | Odor Threshold: N/A |
| Vapor Pressure:        | N/A           | Percent Volatile by Volume: 0 |
| Vapor Density:         | N/A           | Evaporation Rate: N/A |
| Water Solubility:      | Insoluble     | Coefficient of Water/Oil Distribution: NE** |
| Appearance and Odor:   | Dark Gray Metal/Odorless | |
4. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A
Test Method Used: ___
Auto-ignition Temperature: N/A

Hard cemented carbide product is not a fire hazard. Dusts generated in grinding operations may ignite if allowed to accumulate and are subjected to an ignition source.

Flammable Limits: N/A  LEL: ___  UEL: ___

Extinguishing Media: For powder fires, smother with dry sand, dry dolomite, ABC type fire extinguisher or flood with water.

Special Fire Fighting Procedures: For a powder fire confined to a small area, use a respirator approved for toxic dusts and fumes. For a large fire, fire fighters should use self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Dusts may present a fire or explosion hazard when exposed to high temperature or ignition sources. However, this is not expected to be a problem under normal handling conditions.

Hazardous Combustion Products: May generate toxic fumes when heated.

5. HEALTH HAZARD DATA

Routes of Exposure:  
X Skin Contact  
N/A Skin Absorption
X Acute Inhalation  
X Chronic Inhalation
X Eye Contact  
X Ingestion

Effects of Exposure:  
X Carcinogenicity  
X NTP
N/A Other  
X Sensitization
N/A Mutagenicity  
N/A Reproductive Toxicity
X IARC  
N/A Teratogenicity
N/A Synergistic Materials

Inhalation - Dusts or mists can cause irritation of the nose and throat. Inhalation can result in an allergic reaction in individuals previously sensitized, causing difficult breathing. Dusts or mists also have the potential for causing transient or permanent respiratory disease, including occupational asthma and interstitial fibrosis in a small percentage of exposed individuals. Symptoms include productive cough, wheezing, shortness of breath, chest tightness and weight loss. Nickel is suspected of causing nasal and lung cancer. Symptoms include pain, bleeding, nasal obstruction, vision impairment, weight loss and voice resonance change.

Skin Contact - Can cause irritation or an allergic skin rash due to chromium, cobalt, or nickel sensitization in people susceptible to allergic reactions.

Eye Contact - Can cause irritation or conjunctivitis.

Ingestion - Ingestion of large amounts of cobalt over a period of time has the potential for causing blood, heart, and other organ problems. Current scientific information indicates no adverse effects are likely from ingestion of small amounts of nickel dust generated from these products.
5. HEALTH HAZARD DATA (continued)

Carcinogenicity - The National Toxicology Program (NTP) found there was sufficient evidence of carcinogenicity of nickel in experimental animals and limited evidence for the carcinogenicity of nickel in humans. The International Agency for Research on Cancer (IARC) found there was inadequate evidence that metallic cobalt and metallic nickel are carcinogenic to humans, but since there was sufficient evidence that they carcinogenic to animals, IARC concluded that metallic cobalt and metallic nickel are possibly carcinogenic to humans. IARC and NTP found there was inadequate data for the carcinogen city of chromium and trivalent chromium compounds. Cobalt has not been classified as a known or suspected carcinogen by NTP or OSHA. Nickel and chromium have not been classified as a known or suspected carcinogen by OSHA.

Conditions Aggravated by Exposure - Lung and other pulmonary and skin conditions may be aggravated by exposure.

Emergency and First Aid Procedures:

INHALATION - If symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath, etc.), remove from exposure and seek medical attention.

SKIN CONTACT - If irritation or rash occurs, thoroughly wash affected area with soap and water and isolate from exposure. If irritation or rash persists, seek medical attention.

EYE CONTACT - If irritation occurs, flush with large amounts of water. If irritation persists, seek medical attention.

INGESTION - If substantial quantities are swallowed, dilute with a large amount of water, induce vomiting and seek medical attention.

6. REACTIVITY DATA

<table>
<thead>
<tr>
<th>Stability</th>
<th>Unstable</th>
<th>Stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous Polymerization</td>
<td>May Occur</td>
<td>Will Not Occur</td>
</tr>
</tbody>
</table>

Incompatibility: Contact of dust with strong oxidizers may cause fire or explosions.

Materials to Avoid: Strong acids and oxidizers.

Hazardous Decomposition Products: Thermal decomposition may release tungsten carbide, cobalt, and nickel metallic oxides.

Conditions to Avoid: N/A

7. SPILL OR LEAK PROCEDURES

Steps To Be Taken In Case Material Is Released Or Spilled: Ventilate area of spill. Clean up using methods which avoid dust generation such as vacuum (with appropriate filter to prevent airborne dust levels which exceed the PEL or TLV), wet dust mop or wet clean-up. If airborne dust is generated, use an appropriate NIOSH approved respirator.

Waste Disposal Method: Dispose of in accordance with appropriate government regulations. May be sold as scrap for reclaim.
8. SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use an appropriate NIOSH approved respirator if airborne dust concentrations exceed the appropriate PEL or TLV. All appropriate requirements set forth in 29 CFR 1910.134 should be met.

Ventilation: Use local exhaust ventilation which is adequate to limit personal exposure to airborne dust to levels which do not exceed the PEL or TLV.

Protective Gloves: Protective gloves or barrier cream are recommended when contact with dust or mist is likely. Prior to applying the barrier cream or use of protective gloves, wash thoroughly.

Eye Protection: Safety glasses with side shields or goggles are recommended.

Other Protective Equipment: N/A

9. SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storage: Maintain good housekeeping procedures to prevent dust accumulation during grinding. Avoid inhalation and direct skin contact with dust.

Other Precautions: Clean up using methods which avoid dust generation such as vacuum (with appropriate filter to prevent airborne dust levels which exceed PEL or TLV), wet dust mop or wet clean-up. If airborne dust is generated, use an appropriate NIOSH approved respirator.

Wash hands thoroughly after handling, before eating or smoking. Wash exposed skin and remove soiled clothing at the end of work shift. Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or vacuuming (with appropriate filters) the clothing, rags, or other items.

Periodic medical examinations are recommended for individuals regularly exposed to dust or mist.

"FOR CHEMICAL EMERGENCY"
Spill, Leak, Fire, Exposure, or Accident
Call CHEMTREC - Day or Night: 1-800-424-9300

10. ADDITIONAL INFORMATION

In case of questions, please call: Telesis Technologies, Inc.
Customer Service
(800) 654-5696 (U.S. and Canada) or
(740) 477-5000 (ask for Customer Service)
(740) 477-5001 (FAX)

Issue Date: July, 1992
Supersedes: September, 1991

Although Telesis has attempted to provide accurate information herein, Telesis makes no representation regarding the accuracy or completeness of the information and assumes no liability for any loss, damage or injury of any kind which may result from or arise out of the use of or reliance on the information by any person.

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**LEGEND**

* N/A = Not Applicable
** NE = Not Established
*** Depends on grade specification
**** Total dust

#15-00-605
MATERIAL SAFETY DATA SHEET

STEEL PINS

1. PRODUCT DEFINITION

STEEL PINS

PRODUCT NAME:
A Supplemental Chemistry Sheet will be issued for each grade shipped to each customer. See Section 2.

DATE OF PREPARATION:
November 1, 1985

2. HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>CAS NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum (Al)</td>
<td>7429-90-5</td>
</tr>
<tr>
<td>Carbon (C)</td>
<td>7440-44-0</td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td>7440-47-3</td>
</tr>
<tr>
<td>Cobalt (Co)</td>
<td>7440-48-4</td>
</tr>
<tr>
<td>Columbium (Cb)</td>
<td>7440-03-1</td>
</tr>
<tr>
<td>Niobium (Nb-syn with Cb)</td>
<td>7440-50-8</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>7439-89-6</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>7439-96-5</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>7439-98-7</td>
</tr>
<tr>
<td>Molybdenum (Mo)</td>
<td>7440-02-0</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>7440-03-1</td>
</tr>
<tr>
<td>Selenium (Se)</td>
<td>7782-49-2</td>
</tr>
<tr>
<td>Silicon (Si)</td>
<td>7440-21-3</td>
</tr>
<tr>
<td>Titanium (Ti)</td>
<td>7440-32-6</td>
</tr>
<tr>
<td>Tungsten (W)</td>
<td>7440-33-7</td>
</tr>
<tr>
<td>Vanadium (V)</td>
<td>7440-62-2</td>
</tr>
</tbody>
</table>

No Threshold Limit Values (TLVs) exist for specialty steels. TLV may be applicable to constituent elements.

A Supplemental Chemistry Sheet will be sent covering each grade or type of steel purchased. It will have the maximum level of each element that is present and required to be reported by OSHA Hazard Communication Standard 29 CFR 1910.1200.

See Appendix A for the Permissible Exposure Limits as determined by OSHA, ACGIH, and/or IDLH for each component.

3. PHYSICAL DATA

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Solid</th>
<th>pH:</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling Point:</td>
<td>686-5660° C</td>
<td>Specific Gravity:</td>
<td>1.8-19.3</td>
</tr>
<tr>
<td>Freezing Point:</td>
<td>N/A</td>
<td>Odor Threshold:</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>N/A</td>
<td>Percent Volatile by Volume:</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Density:</td>
<td>N/A</td>
<td>Evaporation Rate:</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Solubility:</td>
<td>Insoluble (except Manganese)</td>
<td>Coefficient of Water/Oil Distribution:</td>
<td>N/A</td>
</tr>
<tr>
<td>Appearance and Odor:</td>
<td>Solid, Odorless Metal</td>
<td>Melting Point:</td>
<td>2-17-3410° C</td>
</tr>
</tbody>
</table>

See Appendix A, Chemical and Physical Properties, for additional data (if any) for each element.
Appendix A

4. FIRE AND EXPLOSION HAZARD DATA

Flash Point: None

Fire Point: None

This product is a noncombustible metal.

See Appendix A for any applicable Fire and Explosion Data for each element.

5. HEALTH HAZARD DATA

A. GENERAL COMMENTS

We do not consider this product in the form it is sold to constitute a physical hazard or a health hazard. Subsequent operations, such as heating above 1200° F, cutting, and/or grinding, may cause some of the ingredients to change to a form which could affect exposed workers.

Routes of Exposure: X Skin Contact N/A Skin Absorption X Eye Contact
X Acute Inhalation X Chronic Inhalation X Ingestion

Emergency First Aid:

Inhalation - Remove to fresh air. If condition continues, consult physician.

Eye Contact - Flush well with running water to remove particulate. Seek medical attention.

Skin Contact - Brush off excess dirt. Wash area well with soap and water.

Ingestion - Seek medical attention if large quantities of material have been ingested. (Ingestion of significant amounts of metal is unlikely.)

B. CONSTITUENT HAZARDS

See Appendix A, Permissible Exposure Limits, for the Threshold Limit Values (TLVs) for each constituent.

Effects of Overexposure:

Acute Exposure - Excessive inhalation of fumes from many metals can produce an acute reaction known as “metal fume fever”. Though metals such as copper and zinc have been most associated with metal fume fever, it is suspected by some authorities that other metallic fumes may produce this condition.

Symptoms consist of chills and fever (very similar to, and easily confused with, flu symptoms), which come on a few hours after exposure. Long term effects of metal fume fever have not been noted.

Chronic Exposure - Excessive and repeated inhalation of chromium fumes or dust may cause severe irritation, ulceration, or cancer in the respiratory system – nose, throat and lungs. It is generally believed that the hexavalent forms of chromium (Cr+6) are responsible for these effects. Similarly, excessive inhalation of nickel fumes has been associated with respiratory cancer. Both chromium and nickel are sensitizers and may cause allergic reactions. Excessive and prolonged inhalation of manganese (generally over two years of exposure) can cause damage to the central nervous system – specifically, the pathology resembles Parkinson’s Disease. Molybdenum is not foreseen as a hazard in the present context. Though molybdenum has caused toxicity (anemia and poor growth) in farm animals, there is no documented toxicity to humans due to industrial exposures.
6. REACTIVITY DATA

Stability: Unstable  ✗ Stable

Hazardous Polymerization: May Occur  ✗ Will Not Occur

Incompatibility: Reacts with strong acids to generate hydrogen gas.

Materials to Avoid: Strong acids and oxidizers.

Hazardous Decomposition Products: Metallic oxides.

Conditions to Avoid: Avoid generation of airborne dust and fumes.

7. SPILL OR LEAK PROCEDURES

Steps To Be Taken In Case of Release or Spill: N/A

Special Precautions: Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum.

Waste Disposal Method: Dust, etc. — Follow federal, state, and local regulations regarding disposal.

See Appendix A, Handling Procedures, for additional data (if any) for each element.

8. SPECIAL PROTECTION INFORMATION

Ventilation Requirements: Use general or local exhaust ventilation to keep airborne concentrations of dust and fumes below the TLV. Consult a professional hygienist.

Respiratory Protection: If fumes, misting, or dust conditions occur, consult a professional hygienist. Provide NIOSH approved respirators.

Gloves: Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Personal Protective Equipment: Always consult a professional hygienist.

Eye Protection: Safety glasses should always be worn when grinding or cutting. Face shields should be worn when welding or burning.

Other Clothing or Equipment: As required
9. EMERGENCY FIRST AID INFORMATION

If acute overexposure to fumes occurs, remove the victim to fresh air, then seek medical assistance. See Section 5, Health Hazard Data, Part A, General Comments, for details.

10. ADDITIONAL INFORMATION

In case of questions, please call:
   Telesis Technologies, Inc.
   Customer Service
   (800) 654-5696 (U.S. and Canada) or
   (740) 477-5000 (ask for Customer Service)
   (740) 477-5001 (FAX)

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