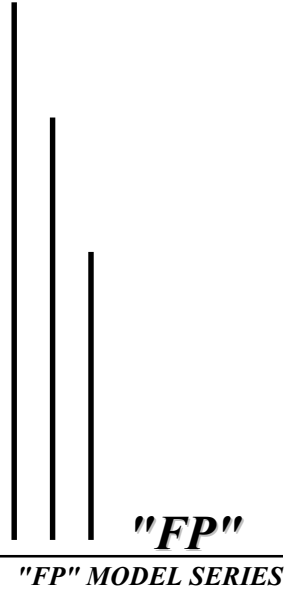


FOIL HOT STAMPING UNIT MANUAL

DIGITAL PRINTING

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Foil Hot Stamp Unit Information

Hot Stamp Unit Model Number **FP100MAR2200**

Hot Stamp Unit Serial Number **71B011**

Foil Printing Controller Model Number **HP-3002**

Foil Printing Controller Serial Number **C1207**

TorKit Die Pressure Gauge Serial Number **N/A**

Factory Ship Date **1/4/08**

Notes

Purchase Order No. **17682**

Contents

I.	Introduction.....	3
II.	Unpacking and Inspection.....	4
III.	Press Preparation.....	5
IV.	System Assembly.....	6
V.	System Startup and Adjustments.....	9
VI.	System Maintenance.....	12
VII.	Notes.....	13
Appendix A: Illustrated Parts List.....		15
Appendix B: Hot Stamping Tips & Tricks.....		19

Section I: Introduction

Thank you for choosing the foil printing system by DMS, Incorporated. The system described in this manual is the result of thousands of combined man-hours of practical experience, along with extensive research and development in foil printing applications.

Please study this instruction manual thoroughly before attempting to assemble or operate the system. Personal injury or damage to system components could result from not following instructions completely.

Over the years, the field of foil printing has grown in diversity and, in many cases, complexity. Due to this fact, we could not possibly cover every potential application with this manual. The manual has been written in very basic, outline form, with an attempt to cover as much ground as possible for the foil-printing newcomer. We encourage you to call DMS with any questions you may have concerning job set-ups, foil selection, job feasibility, etc.

Foil printing newcomers may wish to begin by reviewing APPENDIX B: HOT STAMPING TIPS & TRICKS, for an overview of foil printing.

Veteran users of DMS foil printing systems should note that several new features have been added to our system control unit and die shaft assembly, which should be reviewed before set-up.

Thank you for making DMS, Incorporated your source for foil printing equipment!



Section II: Unpacking and Inspection

Upon receiving the system, please be sure to check all cartons and crates carefully for the following components:

<i>Description</i>	<i>Quantity Shipped</i>	<i>Part Number</i>	<i>Serial Number</i>
1. Temperature Control Unit • Unit comes with handle and locking knobs.	1	HP-3002	C-1207
2. Upper Die Shaft Assembly	1	FP100MAR2200-U	71B011
3. Lower Base Roll Assembly	1	FP100MAR220-L	71B011
4. Accessory Tool Box	1	FP100MAR220-T	N/A
5. TorKit Die Pressure Gauge		N/A	

It is a good practice to keep the cartons and crates that the system is shipped in to reuse them if the system ever needs to be returned for service. Please notify DMS upon arrival if there are any possible omissions or damage to the system during shipping and handling.

Section III: Press Preparation

1. In order to automatically raise the base roll when the press runs, the HP-3002 temperature control unit needs to be supplied with a source of power when the press is in "RUN" mode only. This source of power is referred to as the slave line. Power for the slave line may be **90-280 volts A/C**. There is no appreciable load on the slave line and #16/2 wire may be used for this connection. A mini twist-lock connector is included for proper connection to the temperature control unit.
2. Main system power supplied to the control unit must be rated at **30 amps, 208-240 volts, single phase, A/C**. The supply circuit must be fused for 30 amp service, and #12/3 wire is recommended for this connection. The control unit must be properly grounded to reduce the risk of electric shock hazard. A 30 amp twist-lock connector is included for proper connection to the control unit.
3. Air supplied to the control unit must be **clean, dry, and regulated to 80-100 p.s.i.** Air/line connectors are included for proper connection to the unit.
4. The base roll assembly supplied with the system should be test-fitted in the intended die station. Position the base roll assembly in the station and check for interference and proper alignment with the die station drive-gear. Proper fit and drive gear mesh are critical elements in the system. The base roll should sit level in the station, and the drive gear should not bottom out into the base roll gear.

Section IV: System Assembly

A. Assembling Roll Die to Die Shaft:

1. On a clean, level bench; prepare the die for assembly by gently tapping the drive pin into the appropriate end of the die and setting the die in the “V” blocks provided.
2. Remove the bearing block from the threaded end of the die shaft assembly by removing the 1/4-20 retaining screw, and set the block aside.
3. Slide the gear onto the shaft, making sure the counterbore in the gear faces threaded end of shaft.
4. Slide the gear spacer onto shaft, mating the raised portion of spacer with counterbore in the gear.
5. Slide one of the taper rings onto the shaft, with the taper facing away from spacer.
6. Install shaft assembly into die, aligning the die drive pin with the slots in gear and spacer.
7. Slide the other taper ring onto the shaft, so the taper seats in die.
8. Install 5 wavy washers, "nesting" the washers together.
9. Install die nut lock washer so the angled prongs of the washer point towards the end of the shaft, and the tongue of the washer sits in the groove of the shaft.
10. Install the die lock nut and tighten finger tight, making sure all parts are in alignment.
11. Engage the prongs of the spanner wrench with the grooves in the retaining nut and tighten by hand until the wavy washers have compressed to approximately 1/2 of their original thickness.
12. Inspect retaining nut slots for alignment with one of the prongs on the washer. If none of the prongs line up with a slot, gradually tighten the nut until a slot lines up.
13. Once one of the prongs lines up with a slot, bend the prong over into the slot with a screwdriver. A gentle bump with the palm of the hand should be all that is necessary.
14. Slide the thermocouple block onto the tie bar a couple of inches, so the blades of the thermocouple point opposite web direction. Tighten the retaining screw finger-tight.
15. Re-assemble the bearing block onto the end of the die shaft and install cap screw finger-tight. Final torque on the screw should be applied after the die shaft assembly has been located in the station, to ensure proper alignment of the bearing blocks.

Section IV: System Assembly

B. Thermocouple positioning ("leaf type"):

NOTE: This is an extremely important element in overall print quality! An improperly positioned thermocouple can, and will, cancel all attempts to attain print quality and consistency! Please remember that the reliability of the "thermal joint", or intersection, between the die and the thermocouple is crucial. The temperature control module is actually indicating the temperature of the thermocouple-not the die. The better the connection between the thermocouple and the die, the more accurate and reliable the indicated temperature will be. For laminating, or applications that have a full-face pattern, the thermocouple may be positioned on the end of the roll as near as possible to the face of the die. This practice should be avoided if at all possible, but satisfactory results can be obtained using this method.

1. Gently slide thermocouple-mounting block to a position directly above a blank area of the die. If the tip of the thermocouple is too wide to fit on any blank area of the die, the tip may be carefully trimmed with sharp shears to a minimum width of 1/4", tapering to full width approx. 1" from the tip.
2. Carefully rotate the mounting block until the soldered tip-not the blades-contacts the die. Note that the tip has been ground to provide a flat contact surface. If the tip of the thermocouple does not align with the die surface the blades of the thermocouple may be gently bent to form an arc, or "S" shape, as required to attain even tip contact. Slight pressure at the thermocouple tip should be maintained at all times.
3. Once proper thermocouple alignment is attained; rotate the thermocouple away from the die surface and place a generous amount of thermocouple grease on the die surface, in line with the thermocouple. Rotate the die in the normal direction of rotation and smooth the grease into a continuous stripe with a wooden or plastic scraper, or the tip of a finger. Rotate thermocouple back into position and tighten retaining screw finger tight.

C. Assembling Components in Die Station:

1. Install the base roll assembly into the station to be used, making sure both of the bearing blocks are orientated with the spring pockets up. Check for proper drive gear mesh.
2. Install proper die springs in the spring pockets of the base roll bearing blocks.
3. Install the die assist assembly in the station checking for the correct bearing block alignment into the station, making sure the die springs are seated in both the top and bottom pockets.
4. Tighten the bearing block retaining screw previously removed while mounting die to shaft. Check for binding. If die is difficult to rotate, loosen screw and re-torque.
5. The lateral register adjusting plates have been left at their outermost (loosest) position to facilitate an easy first time fitting in the station. To adjust these plates, apply slight outward pressure to the shaft assembly and adjust the plates for a snug slide fit on the side frame. Be sure retaining screws are tight.
6. Slide the die screw pressure plates over the tie bar at either end of the die shaft assembly. Install pressure screws in the usual manner, making sure that the screws are in line with the bearing blocks to prevent bending of the tie bar, and the screws contact the depressions in the screw plates. Tighten the pressure screws until the gears just start to mesh and the gear side of the die sits slightly lower in the station. This is insurance against "crashing" the base roll into the die when first starting the system.

NOTE: No more than 250 lbs./side of pressure should be applied at any given time. Excessive pressure will result in premature bearing failure and possible tooling damage.

Section IV: System Assembly

D. Connections:

1. Position the HP-3002 temperature control unit on a flat, level surface near the intended station and within easy reach of the operator.
2. Connect power cord to die shaft assembly by inserting plug into receptacle and turning clockwise to lock. Repeat procedure at control unit.
3. Connect air lines labeled “A” and “B” to their corresponding outputs on the control unit by pushing line squarely and firmly into fitting. Repeat procedure at respective fittings on base roll actuator.
4. Connect air line labeled “C” to the cooling output on the temperature control unit. And to the air inlet on the die shaft assembly.
5. Connect the infrared thermocouple lead to the socket on the control unit, aligning the wide and narrow blades of the plug with their corresponding slots in the socket.

NOTE: Please be sure to route all cables and air lines carefully! Personal injury and/or damage to the equipment could result from lines or cables becoming caught in moving parts!

E. Thermocouple Positioning (non-contact infra-red):

1. Gently insert thermocouple into mounting block by rotating the block around the thermocouple until it is fully threaded into the block.
2. Carefully snap the mounting block into the die assist assembly by inserting the “C” channel end of the block around one die assist shaft, then rotate the block down to lock into place against the opposite shaft.
3. Once the thermocouple has been properly mounted on the die assist assembly, it should slide smoothly along the die assist shafts.
4. Position the thermocouple directly above the black stripe located on the hot stamp die, **no closer than ½” from the die surface**. If the thermocouple is not positioned over the black stripe, or is too close or too far away from the die, it will not accurately read the die temperature which will result in poor print quality.

NOTE: This is an extremely important element in overall print quality! An improperly positioned thermocouple can, and will, cancel all attempts to attain print quality and consistency! Please remember that the thermocouple must be positioned directly over the black stripe on the die to work properly.

Section V: System Startup and Adjustments

NOTE: Foil positioning, tension, and process temperature will all vary somewhat depending on differences in print patterns, substrates, press speeds, foil performance, etc. Some experimentation may be necessary to obtain the best results with your application. For the reasons listed above, the following instructions have been left intentionally brief.

1. Web press as usual, then web the foil from the unwind through a web idler approximately 3-5 inches ahead of the station, then along the web through the die and base roll. Strip the foil about 2-3 inches after the die and to the waste wind-up. The foil should lie flat against the web as it enters the die, with little or no wrinkling during operation. The distance from the die where the foil joins and leaves the web will vary according to the actual application, but the foil needs to be “paced” with the web at some point, to keep the foil from traveling faster than the web. See Figure 1 and Figure 2 on the following pages for a basic webbing diagram.
2. Make sure the MAIN POWER switch is in the “OFF” position. Connect the power to the control unit and turn the MAIN POWER switch to the “ON” position. After an initial diagnostic check, the temperature control module will display the current set point in the middle display and the current die temperature in the upper display.
3. Set the desired process temperature (consult your foil manufacturer) by pressing the UP or DOWN buttons until the desired temperature appears in the “SET” display. Press the ENTER key to lock in the new set point. If you do not press the ENTER key within 5-10 seconds after keying in a change, the control module will return to the previous set point.
4. As the die nears the set point, run the press at 50-75 FPM. Turn the impression mode switch on the control unit to the “AUTO” position and observe the action of the base roll to be sure it rises to the print position.
5. Bring the die into contact with the web and apply slight pressure with the pressure adjusting screws. Note print quality and current die temperature. Lock pressure-adjusting screws, but do not over tighten.
6. Adjust any other press operations as necessary, in accordance with standard operating procedures.
7. After all other press operations have been adjusted for quality and register, gradually increase press speed, adjusting pressure and temperature to maintain foil print quality.

Section VI: System Maintenance

A. Base Roll Assembly

1. Daily
 - a. Inspect base roll for damage or excessive wear. Clean any foil adhesive build-up with solvent on a soft cloth.
 - b. Inspect die drive gear for proper lubrication and excessive wear.

B. Die Shaft Assembly

1. Daily
 - a. Inspect wavy washers for broken or missing pieces.
 - b. Inspect drive gears for excessive or abnormal wear.
 - c. Check thermocouple for loose connections, proper position or lubrication, and damage.
2. Weekly
 - a. Inspect shaft bushings for excessive wear or cracks due to shock. The shaft assembly needs to be returned to DMS to have new bushings installed, as special tools and fixtures are required for this procedure to ensure proper operation.
 - b. Inspect connections for loose or damaged parts.
 - c. Inspect lateral register assembly for proper fit in the press.

C. Control Unit, Hoses and Cables

1. Weekly
 - a. Inspect hoses and cables for damage.
 - b. Make sure all connections are secured and locked.

APPENDIX A

Illustrated Parts List

APPENDIX B

Hot Stamping Tips & Tricks

A. About Foil Printing

Rotary foil printing is accomplished by laminating a roll leaf material to the web. By running the two materials through a station that has a heated, engraved impression die and a suitable base roll, and then stripping the roll leaf material from the web; leaving the transferred image on the substrate and rewinding the waste foil.

In the DMS Foil Printing System, the die is a photo engraved and hand-finished brass roll. The die is mounted on a custom-engineered shaft/heater assembly.

The base roll assembly uses a hard (90-100 durometer) base roll mounted on an eccentric shaft within the intended die station and a pneumatic rotary actuator outside the station, connected to the shaft. The base roll is rotated up into print position only when the press and the HP-3002 control unit are in "RUN" mode.

The system control unit, using a microprocessor based temperature control module and solid state relay, controls the temperature and base roll actions.

Signals are received by the control unit from an infrared thermocouple mounted on the die assist and from the "RUN" circuit of the press run relay through a "slave line".

B. About Roll Leaf (foil)

The foil used in hot stamping today is usually an extruded film carrier with several layers coated on one side. These layers consist of a release agent, a pigment (or pattern of pigments), and an adhesive agent (often referred to as "sizing"). The formulation of these layers varies depending on the application.

During the foil printing process, heat from the die travels through the foil layers, activating the release agent and sizing simultaneously, which causes the transfer of material from carrier to substrate. The performance of these two layers together give the foil its specific traits, such as how long the foil needs to be left on the web before it is stripped and where the stripping idler is placed.

The three factors that affect foil transfer the most are: heat, dwell, and pressure.

Below a certain heat threshold, the reactions necessary for proper release will not occur consistently, and poor print quality will result.

Dwell is the amount of time the transfer has to occur between the die and base roll. The greater the web speed, the less time (dwell) the transfer has to take place. Increasing die temperature will compensate for reduced dwell, to a point, but there are physical limits to how fast heat can travel from the surface of the die through the foil. Foils that will accept a short dwell are considered "loose", while foils that require a long dwell (or high heat) are considered "tight".

A certain amount of pressure is needed to aid the release action of the foil, but generally not enough to deform the substrate substantially. Image size and configuration will affect pressure requirements almost as much as foil sizing and release properties.

Appendix B: Hot Stamping Tips & Tricks...continued

C. About Temperature Control

Rotary foil printing is a fairly demanding application for temperature control. Most temperature control applications are much more “stable” in that they don’t have as many system variables. Die size, web speed, substrate used, and impression size all affect how quickly heat is dissipated from the die surface.

In the DMS Foil Printing System an infrared thermocouple is used to sense the die temperature. It is important to note that the thermocouple sensor must be located directly over the black stripe on the surface of the hot stamp die.

If you notice a rapid change in the indicated temperature while running a job, immediately check the thermocouple sensor for proper position, insulation from ambient air, etc., as it is impossible for the die itself to change temperature very quickly.

D. About Handling Foil

It is most common to use the existing laminating unwind and waste rewind for controlling the foil web. Naturally, you will want to match the length of the foil rolls to the substrate rolls whenever practical, to help cut down on press down time and make the job run as economically as possible. Your own requirements will determine which set-up is best for you.

- Foil build-up (from burning the foil) is hard material. If left on the surface of the die during a run, this build-up can dent the surface of the die, causing permanent damage. Build-up can be removed by using the supplied cleaning brush, wood, or lead to scrape the surface of the die. Return the die to DMS if there is any fear of damaging the die.
- Foil tension should be kept fairly light, compared with web tension. Foil tension affects release action. Excessive foil tension will adversely affect release action of the foil, while too little tension will cause wrinkling.
- If you’re having problems with foil release, try stripping the foil a little closer or farther away from the die. Some substrates require as much as 8-10” of cooling area before stripping the foil.
- Foil strips better (cleaner) when a small diameter roller strips it. Knife-edges are also sometimes used.
- Depending on the size of the roll, side plates may be desirable on the foil to prevent telescoping while unwinding and to provide better tension control.

E. About Handling Dies

- Always use the wooden “V” blocks to temporarily store or assemble dies.
- Use the shipping crate to store dies and prevent damage.
- Never use abrasive cleaners on dies.
- If die becomes tight on shaft, warm the die to 150-200 °F, then try disassembling. Have the die resized ASAP.
- If the die is brushed periodically during a job (every 15-20 min.), print quality and consistency will be improved.
- Remember to keep the black stripe on the die clean.
- Insulated welding gloves are great if you plan to handle hot dies regularly.

