Operation and Maintenance Manual
Magnetic Drive Sealless Pumps
MPL/MHL SERIES

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!WARNING! MAG-DRIVE PUMP

DO NOT WORK ON THIS PUMP IF YOU ARE WEARING A MEDICAL DEVICE (DEFIBRILLATOR, PACEMAKER, ETC.) PERSONNEL WHO EXPERIENCE INTERFERENCE WITH THEIR MEDICAL DEVICE SHOULD MOVE AWAY FROM THE PUMP AND REFRAIN FROM HANDLING MAGNETIC PUMP COMPONENTS. SEEK IMMEDIATE MEDICAL ATTENTION IF YOU HAVE EXPERIENCED INTERFERENCE WITH YOUR MEDICAL DEVICE.

The rare earth permanent magnets in this pump have been manufactured such that the magnetic field is directional toward each half of the magnetic coupling. For this reason, the magnetic field that exists outside of the assembled magnetic coupling is minimal. When the two halves are apart, the magnetic field is exposed, which is why we recommend that personnel wearing medical devices DO NOT HANDLE the magnetic coupling components. When the pump is assembled, the magnetic fields from the magnetic coupling components are not exposed and it is safe for wearers of medical devices to be in the general proximity of the assembled pump, whether the pump is in operation or not.

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WARNING:
WHEN WORKING ON MAGNETICALLY DRIVEN PUMPS

- Strong magnetic fields may damage watches, credit cards, computers, computer tablets, cell phones and other electronic equipment when these are exposed to the magnetic fields of the exposed magnetic coupling components.

- People with pacemakers should be cautioned that the strong magnetic field may upset the timing or cause the pacemaker to malfunction.

- When working on the pumps, be aware that tools or metal parts brought within close proximity to the magnets may suddenly be attracted trapping fingers in the process.

OPERATING INSTRUCTIONS
MPL/MHL ANSI DIMENSION PUMPS

This instruction manual is intended to assist those responsible for the installation, operation and maintenance of **MAGNATEX** Magnetic Drive Sealless Pumps. The MPL Pump Series is rated up to 300°F and the MHL Pump Series is rated to 536°F, both at 150 psi. We recommend thoroughly reading this manual and reviewing the Hydraulic Institute Standards regarding Horizontal Centrifugal Pump installation before installing and operating your pump.

RECEIPT OF EQUIPMENT

A. Prior to uncrating, check for physical damage to the pumping system and notify the common carrier **IMMEDIATELY** if any damage is found.

B. Check the nameplate on the pump against receiving and purchase order documents to be sure that the correct size pump and materials of construction have been supplied. If a motor has been supplied, check for correct horsepower, speed, and voltage.

C. Check to see if flange protectors are intact. If not, check for foreign objects which may have found their way into the pump casing through the flange openings.

D. Check for free rotation of the pump. Remove the motor fan guard and rotate the pump using the motor fan. Only slight resistance should be felt. If the pump has heavy resistance, or if any crunching or grinding noise is heard, call your MAGNATEX representative or **MAGNATEX PUMPS INC.** (713-972-8666).

STORAGE PROCEDURES

As shipped, the pumps are suitable for short term storage only, ~3-6 months, and the pump unit should be stored indoors in a protected environment away from weather extremes. If long term storage is necessary before the pump will be put into operation, contact your local representative or **MAGNATEX PUMPS, INC.** for long term storage recommendations.
For maximum protection cover the pump with plastic or some other protective material. Motors should be greased (only if grease fittings are provided) and rotated by hand every three (3) months. Maintain pump nozzle flange covers in place until ready to install the pump. Before start-up, refer to the section titled "Rotation Check and Start-Up" (page 6).

PUMP AND MOTOR ALIGNMENT

MPL/MHL pumps are close-coupled pumps with the motor fitted to the pump frame adapter with a machined register fit that eliminates the need for external pump and motor alignment.

FOUNDATION

The foundation should be firm and heavy to reduce vibration and prevent flexing which can result in misalignment. A concrete foundation with a solid baseplate is recommended. Foundation bolts of the correct size should be located by reference to certified drawings. A baseplate is not necessary, but is available as an option in steel, stainless steel and non-metallic quartz-polymer materials**.** Anchor bolts for non-metallic baseplates should be torqued to only 15-20 ft-lbs.

LOCATION & PIPING

A. Locate the pump as close as practical to the source of liquid supply.

B. The suction line should be as short and straight as possible and contain a minimum number of elbows. Any elbows should be the large radius type. Elbows and fittings should be no closer than 10-20 pipe diameters to the pump suction to allow undisturbed flow to the pump impeller. The higher the velocity the greater the distance of straight pipe is needed.

C. Generally, suction piping should be one or two sizes larger than the pump suction to keep friction loses to a minimum. This becomes more important as the distance between the pump and the liquid supply increases, or similarly, if the piping fittings/connections are located closer than 10-20 pipe diameters to the pump's suction; see B above.

D. The suction piping should have no high spots where air pockets can collect. All joints in the suction line should be tight to prevent air from entering into the system and creating the possibility of vapor locking. This is especially important when suction pressure is lower than the atmospheric pressure. A compound pressure gauge should be installed in the suction line at two pipe diameters from the suction flange.

E. An air vent should be installed at the initial high point in the pump discharge line. A check valve and shut-off valve should be installed as close as possible to the pump discharge nozzle. The check valve is installed to protect the pump from excessive back pressure, including reverse flow / rotation, and back flow during shut down or driver failure. The discharge valve is located at the pump discharge to regulate flow and isolate the pump for servicing. A pressure gauge should also be installed on the

discharge side of the pump as close as possible to the discharge nozzle between the pump and discharge valve.

F. Prior to starting the pump, it is important to flush the piping to insure the system is free of foreign matter and particles such as pipe scale, welding beads and dirt from system fabrication. Large particles can block the bearing lubrication ports in the pump causing serious damage. In addition, metallic particles can magnetically attach to the inner magnet also resulting in damage. If possible, a temporary startup strainer with a 40x40 US mesh screen should be installed in the pump's suction line. **BE VERY CAREFUL** not to allow the temporary strainer to be plugged to the point of starving the pump of liquid, resulting in cavitation and the possibility of running the pump dry. Since running the pump dry can destroy the pump's bearings, it is recommended to install a compound pressure gauge between the strainer and pump suction to monitor partial plugging of the strainer. The discharge pressure should also be closely monitored. Any drop in discharge pressure without discharge valve throttling could indicate partial strainer plugging (assuming constant demand to the system).

G. Magnatex pumps, although very rugged, are not designed to handle excessive pipe stress. The resulting forces and moments on the pump can result in misalignment and possible damage to the pump. Piping must be anchored as close to, but independent from the pump. Pump and pipe flanges must be positioned together with gaskets (supplied by others) before attempting to tighten flange bolts. See Nozzle Loading Criteria, drawing ED-4160 on Page 14.

H. The pump **MUST NOT RUN DRY**. To assure that adequate liquid is available to the pump suction, a flow sensor and /or power monitor should be installed to shut the pump down in the event of dry run. **MAGNATEX** provides an optional electronic power monitor offered at time of pump quotation to prevent dry run operation when properly installed and set according to the normal operating parameters of the pump.

ROTATION CHECK, AND START-UP

Removal of air from the pump system is critical for proper system and component performance. Trapped air/vapor voids in the system piping can cause reduced discharge pressure readings and "choked" system flow. Safely vent all air/vapor from the system following best operational procedures.

Before the pump is placed in service check the direction of motor shaft rotation as noted below. Rotation should match the cast-in arrow or label and the direction of the casing scroll terminating under the discharge flange.

ROTATION

A. Open the suction and discharge valves and allow the pump to be filled with liquid. Vent piping at system vent points.

!WARNING! NEVER RUN THE PUMP DRY

B. Remove the motor fan guard for visual inspection of motor shaft rotation.

C. Bump the motor by quickly pushing the motor start/stop buttons. Rotation should be clockwise as seen from motor end. If the direction of rotation is incorrect, reverse two of the three-phase power leads to the motor at the motor conduit box.
D. After confirming proper rotation open the motor electrical disconnect and install the motor fan guard.

PRIMING

A. Open the suction and discharge valves and allow the pump to fill with liquid. If the direction of rotation has not been checked, this must be done as detailed above under Rotation Check and Start-up before proceeding.

!WARNING! NEVER RUN THE PUMP DRY

B. Close the discharge valve to 1/4 open.
C. Start the motor and immediately check the discharge pressure gauge. The pressure should rise quickly and hold steady. If the pressure rises and then falls back, there is air or vapor in the system. STOP THE PUMP IMMEDIATELY. Wait 15 to 20 seconds before restarting the pump.
D. If after repeating Step C several times, the pressure gauge does not hold steady or does not yield the expected pressure (from performance curve), contact your Magnatex representative, or **MAGNATEX PUMPS INC.** (713-972-8666) for assistance. Do not continue to operate the pump under these conditions.
E. Once the pump is fully primed and the discharge pressure is steady, slowly open the discharge valve until the desired operating point is reached as referenced by discharge pressure reading and /or flow meter indication. The flow and head should match the design performance curve for the pump as ordered.

LUBRICATION OF PUMP PROCESS BEARINGS

MPL/MHL pumps have Silicon Carbide (SiC) hydrodynamic bearings on the process side of the pump that are internally lubricated by the pumped liquid. The pump must have liquid in it during operation to avoid damage and breakage of these product lubricated bearings. An optional material of SiC-X is available for enhanced resistance to lubrication and system upset conditions. Contact your Magnatex representative or **MAGNATEX PUMPS INC.** (713-972-8666) for more information.

OPERATIONS AND MAINTENANCE

A. Operators should make frequent visual inspections to insure the pump is running smoothly without noise or vibration, and that the discharge pressure is holding steady without fluctuation. Any excessive heating of the pump or motor bearings is cause for alarm. The unit should be shut down immediately, an investigation made to determine the cause, and corrective action taken.

B. Follow the motor manufacturer's recommendations and keep the motor bearings lubricated properly.

WARNING! Never throttle the pump by closing the valve on the suction side of the pump. Throttling the suction side can cause serious damage to the pump. Throttle only from the discharge valve.

WARNING! Never operate the pump against a closed discharge valve for more than a few seconds. Low flow operation can cause rapid heating of the pumped liquid with possible vaporization and the pump bearings running dry, resulting in serious damage to the pump.

MAINTENANCE SCHEDULE

Part to be Inspected	Inspection Value	Frequency
Inner Magnet Sub-Assembly	Dismantle and check Thrust Rings, Sleeves, and Silicon Carbide Bushings for wear. Use new gaskets upon reassembly.	Every 2 to 3 Years
Motor	As directed in the motor operations manual	As directed in motor manual

TORQUE CHECK

Since the MPL/MHL pumps are close-coupled to the motor, it is necessary to remove the motor fan guard to allow access to the motor shaft where the fan is installed. Also, the pump and motor unit must be removed from the system to allow access to the impeller nut through the pump suction nozzle. To determine the static breakaway torque of the magnet coupling, a torque wrench is used on the impeller nut while holding the exposed end of the motor shaft with a wrench or other suitable tool. Proceed as follows:

A. Remove the motor fan guard and remove the motor fan.

B. Select the appropriate socket size for the pump impeller nut for use with the torque wrench. The torque wrench should be compliant with a regular calibration schedule.

C. Check that the pump and motor unit is securely anchored to prevent movement of the unit during the torque tests.

D. Grip the motor shaft with a wrench, strap wrench, or appropriate tool to hold against rotation of the motor shaft. DO NOT DAMAGE the motor shaft while using the tool to hold the motor shaft stationary!

E. Set the torque wrench using an initial torque setting below the minimum torque

(~20% below the value listed for the respective magnet size) in the table on Page 22. Placing the torque wrench socket on the pump impeller nut, slowly turn the torque wrench in the clockwise direction (CCW as seen from motor end – tightening direction for the impeller nut) until the torque setting is reached or the magnets turn over (decouple).

F. If the magnets do not decouple at the initial torque wrench setting, increase the torque wrench setting and repeat step D (~10% below the magnet torque value) in successive trials until the minimum torque value is reached or the magnets decouple. If the magnets decouple before the minimum value is reached, the inner magnet and possibly the outer magnet must be replaced.

G. If the magnets do not decouple before reaching the minimum valve, the actual decoupling value can be determined by successive tests above the minimum value until the magnets do decouple (turn over).

GENERAL NOTES

A. All inner magnets are marked "FRONT" to assist in correct position for reassembly. This marked end of the magnet must face the impeller of the pump.

B. Do not mix inner and outer magnet sizes. Inner magnet size should correspond with outer magnet size, such as V40N inner and outer magnets or V65N inner and outer magnets, NOT V40N inner and V65N outer magnets. Do not high temperature magnets with low temperature magnets.

C. All casing covers and rear casings are marked "UP" on outer flange surface and utilize a rocker pin to assist in proper positioning.

D. When accomplishing maintenance tasks and during reassembly, all threaded fasteners must be torqued in accordance with the torque table below.

RECOMMENDED TORQUE VALUES FOR INTERNAL BOLTS AND SCREWS ALL MPL/MHL SERIES ANSI DIMENSIONED PUMPS

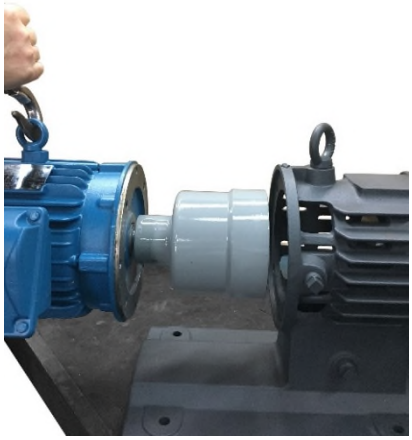
MPL/MHL MODEL (ALL MAGNET SIZES)	6 Impeller Nut (ft. lbs.)	11 Impeller Nut Set Screw (in. lbs.)	7 Sleeve Bolt (ft. lbs.)	12 Sleeve Bolt Set Screw (in. lbs.)	8 Hex Socket Head Bolt (in. lbs.)	66 Casing Hex Head Bolt (ft. lbs.)	67 Hex Head Bolt (ft. lbs.)	76 Outer Magnet Set Screw (ft. lbs.)
40 42LF 42 84 84-8 85 52LF	72	42	33	42	106	31	31	106

MPL/MHL DISMANTLING

DISMANTLING THE PUMP

1. Remove the pump from the system for dismantling in the shop on a sturdy workbench. Secure the pump to the bench top with clamps or bolting.
2. Remove the (8) hex head casing bolts (Items 66) and pull the casing (Item 1) from the pump assembly. Inspect the casing interior for signs of wear or corrosive action from the pumped liquid. Replace the casing if the wear is greater than 0.065" in more than 20% of the casing interior surfaces. Remove the casing gasket (Item 33) and discard it. A new gasket should be used at re-assembly of the pump.

3. Working from the motor side of the pump, remove the (4) hex head capscrews securing the motor to the pump frame adapter (Item 50).
4. Support the motor with a crane or blocks underneath the motor body to facilitate pulling motor out on a straight line corresponding to the motor shaft centerline. Using a pry bar or flat blade screwdriver, work the motor loose from the machined fit between the motor C-face and the pump frame adapter at the small gap between the two pieces. It may be necessary to use a rubber or dead-blow mallet to loosen the motor fit.
5. Once the motor fit is loose allowing the motor to be removed, firmly grasp the motor and disengage the magnet coupling by pulling the motor out and in a straight line along the motor shaft axis, removing the motor with the outer magnet (Item 48) on the motor shaft.



⚠WARNING ⚠

BE CAREFUL TO AVOID TRAPPING YOUR FINGERS BETWEEN THE MOTOR C-FACE FIT AND THE FRAME ADAPTER. PULL THE MOTOR OUT IN ONE MOTION UNTIL FREE OF THE FRAME ADAPTER AND THE MAGNETIC ATTRACTION OF THE MAGNET COUPLING.

6. If the motor is to be replaced, the outer magnet must be removed from the motor shaft. Loosen the (2) outer magnet set screws (Item 76) and pull the outer magnet from the motor shaft. Place the outer magnet in a plastic bag to protect it from attracting metallic particles that would cling to the magnet segments while the pump is dismantled. The plastic bag must be removed prior to re-assembly of the pump.
7. Working from the pump side of the frame adapter, remove the (4) hex head capscrews (Item 67) in preparation for removing the **PB Assembly**. Grasp the flange of the rear casing (Item 4) and pull it free from the pump frame adapter.

8. With the PB Assembly resting on the flange flat edge and the back of the rear casing can locate and remove the impeller set screw (Item 11). Using a small cordless impact drill tool, remove the impeller nut (Item 6) from the pump shaft (Item 16). DO NOT use the impact tool during re-assembly to avoid breaking the Silicon Carbide (SiC) components.
9. Lift the impeller (Item 2) off of the shaft and remove the impeller key (Item 15) from the shaft.

10. Remove the (4) hex socket head bolts (Item 8) that retain the casing cover (Item 3) to the rear casing. With care to prevent the SiC front bushing (Item 42) from falling out as the casing cover is removed, lift the casing cover off the shaft.
11. Remove the SiC front bushing from the casing cover retaining bore. Inspect the set screw (Item 13) for damage or looseness and replace if damaged and tighten if loose.
12. Remove the SiC shaft sleeve (Item 43) and thrust ring (Item 44) from the shaft. Grasp the end of the shaft and pull it out of the rear casing, being careful to prevent the SiC rear bushing (Item 42) from falling, if it comes out with the shaft.

13. Working with the shaft, remove the sleeve bolt set screw (Item 12). Unscrew the sleeve bolt (Item 7) using a hand wrench while holding the inner magnet and the wrench end on the sleeve bolt with both hands. (DO NOT place the inner magnet in a vise to prevent damage to the magnet cladding.) Strike the free end of the wrench on the table top to loosen the right-hand threaded sleeve bolt. Once loosened, remove the sleeve bolt by hand, and remove the SiC rear shaft sleeve and thrust ring.
14. Remove the shaft from the inner magnet (Item 40).

15. Working with the rear casing, inspect the set screw (Item 13) in the bushing bore at the bottom for damage or looseness, and replace if damaged, and tighten if loose.
16. This completes the dismantling of the pump.

INSPECTION OF USED PARTS – REPLACE OR RE-USE?

Inspect all parts for wear. The following are not rigid rules, but guidelines which should be used with all the service conditions in consideration, including safety concerns, i.e. what are the consequences of placing a used part back in service should it fail? In general, Magnatex recommends returning a pump to like new condition when re-building a pump or when pressure components show signs of wear. Use your best judgement with safety in mind.

1. Chatter marks on the SiC components are allowed if the surfaces are still smooth. Cracks or chips in the SiC components are not allowed. Used SiC components may be re-used if a dye-penetrant NDE test reveals no "hairline" cracks.
2. Remove any burrs from metal components, particularly in any bore fit to allow easy assembly. All of the pump components are "slip-fit" construction and pieces should not be forced together.
3. When inspecting the rear casing the mechanic should look for:
    a. Signs of mechanical wear such as scratches, gouges (from broken SiC), or swirl (scalloped) marks at the bottom of the rear casing in the largest diameter, which indicates solids are in the pumped liquid. If the SiC bearing fits can be cleaned up to allow smooth insertion of the SiC bushing and the casing walls are not breached (damage less than 15% of wall thickness and less than 25% of the combined surface area) the rear casing may be placed back in service after a hydrostatic test of 150% of MAWP. Otherwise, Replace.
    b. The original machine marks are typically visible and can be felt by dragging a small piece of hard plastic along the ID of the can portion. If you know the part is clean of chemicals, etc. a fingernail works well for this. If the surface is smooth indicating chemical action on the can portion the thickness should be measured and recorded for monitoring on subsequent inspections. A reduction of 10% of the wall thickness indicates time for replacement. A reduction of 5% in a year indicates close monitoring is required and a change in materials of construction should be considered.
    c. Dents. Not allowed. Replace.
    d. Swollen or bulging side walls of the can portion. Not Allowed. Replace.
4. The motor should be checked electrically by qualified personnel or motor shop to determine the condition of the motor prior to placing it back in service.

MPL/MHL ASSEMBLY

ASSEMBLY OF WETTED END

1. Place the inner magnet key (Item 16) with material stamp facing up onto the inner magnet shaft (Item 5) keyway. Slide the inner magnet (Item 40) onto the shaft from the sleeve bolt end (opposite impeller end). The embossed numbers on the magnet end should face the motor (rear) side of the pump.
2. Slide a thrust ring (Item 44) over the inner magnet shaft from the sleeve bolt end. The hole in the thrust ring should face the inner magnet and the notch should engage the exposed, rounded portion of the inner magnet key.
3. Slide a sleeve (Item 43) over the inner magnet shaft and engage the remaining portion of the inner magnet key with the notch on the sleeve end.
4. Thread the sleeve bolt (Item 7) into the inner magnet shaft. Tighten and secure with the sleeve bolt set screw (Item 12).
5. Working with the rear casing (Item 4), thread a set bolt (Item 13) into the rear bearing holder at the bottom of the rear casing can. Carefully slide a bushing (Item 42) into the rear bearing holder and engage the set bolt with the notch on the bottom of the bushing. Be sure the bushing notch has engaged the set bolt and is bottomed, and the bushing can rotate slightly to be stopped by the set bolt.
6. Thread a set bolt (Item 13) into the shaft flange from the impeller end and tighten. Lift the inner magnet assembly by the shaft and slowly slide it into the rear casing. Be careful of the tight tolerances between the rear bushing and sleeve. This should only be done when the outer magnet is removed.

7. Slide a thrust ring onto the shaft so the hole engages the set bolt. Slide a sleeve onto the shaft so the notch is opposite the thrust ring.
8. Place the rear casing on its side for horizontal installation of the casing cover. Align the keyed portion of the inner magnet shaft with the notch in the sleeve. Insert the impeller key (Item 15) onto the shaft and engage the sleeve notch with the rounded end of the key.

9. Insert a set bolt (Item 13) into the front bearing holder on the casing cover (Item 3). Slide the other bushing into the bearing holder and engage the set bolt with the notch on the bushing end.
10. Align the two flush holes vertically on the casing cover so the pin located on the VERTICAL POSITION of the rear casing flange engages the hole in the casing cover. Hold the loose bushing in place while sliding the casing cover over the

shaft being careful of the tight tolerances between the bushing and sleeve. The stamped word 'UP' should be at the top, 12 o'clock position.

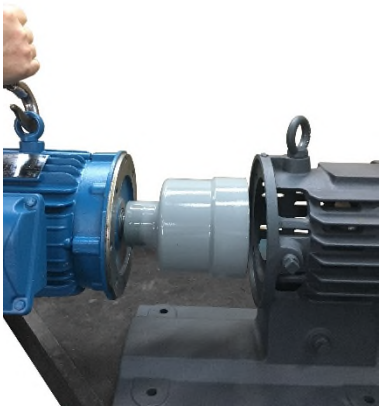
11. Bolt the casing cover to the rear casing using the (4) hex socket head bolts (Item 8). Tighten the bolts evenly to avoid binding, and torque in accordance with the torque table on page 9. Check for free rotation of the assembly

12. Place impeller key (Item 15) into the shaft keyway with material stamp facing up and slide the impeller (Item 2) onto the shaft. Thread on the impeller nut (Item 6). Tighten and torque the impeller nut and then secure the impeller nut with the set screw (Item 11). [This completes the rotating assembly, also called the **PB assembly**.]
13. Mount the rotating assembly to the frame adapter (Item 50) using the four hex head bolts (Item 67). Evenly tighten the bolts and torque in accordance with the torque table on page 9.
14. Mount the outer magnet (Item 48) on the motor shaft. Tighten the outer magnet set screw (Item 76) and torque in accordance with the torque table on page 9. Ensure that no foreign metallic objects come in contact with the outer magnet that could be attracted to the magnets. Remove any metal shavings or grinding particles that have become attracted to the magnets using the adhesive side of tape or similar material.
15. For MHL pumps be sure the (3) heat insulation sheets (Item 101) are in place between the motor C-face flange and the frame adapter for this step. Install the motor to the

⚠ WARNING ⚠

BE CAREFUL TO AVOID TRAPPING YOUR FINGERS BETWEEN THE MOTOR C-FACE FIT AND THE FRAME ADAPTER.

frame adapter using caution as strong magnetic forces will pull the magnets together. Carefully position the outer magnet to fit over the rear casing without touching the sides of the rear casing can or the magnet segments of the outer magnet and move the motor to the frame adapter to engage the magnet coupling. Ensure the motor flange pilot spigot engages the machined recess on the frame adapter and is square to the frame adapter flange face. A small AND EVEN motor flange gap is normal. Tighten the motor mounting bolts to 55 ft-lbs.



16. Working at the process end of the pump now, place the new gasket (Item 80) into the pump casing (Item 2) and locate the pump casing to the rotating assembly making sure the casing gasket did not

slip out of place to prevent pinching the gasket. Bolt the casing in place with the (8) hex head casing bolts (Items 66). Tighten the bolts evenly to avoid binding, torqueing the bolts per the torque table on page 9.

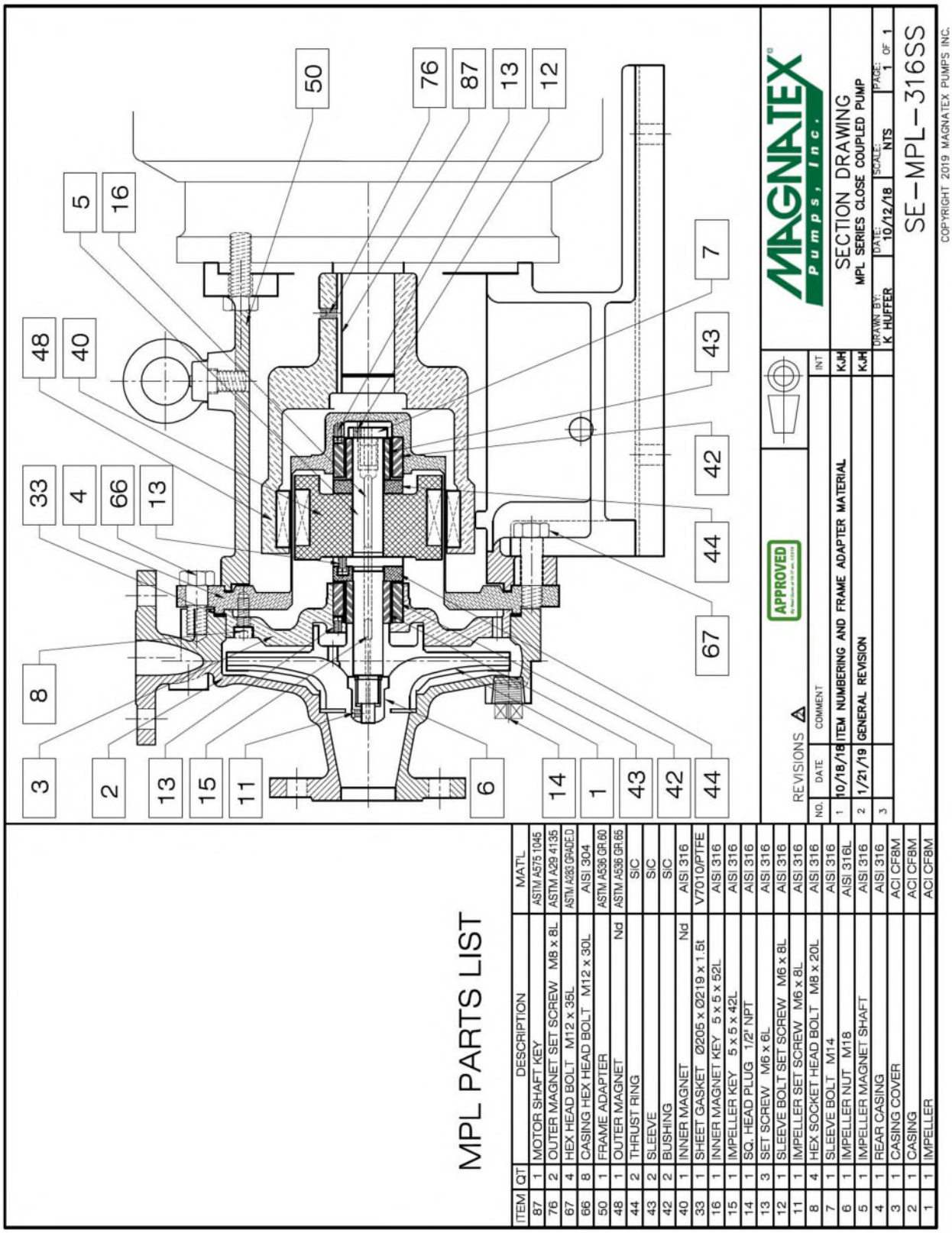
17. Make a final inspection by turning the pump shaft by hand, checking for free rotation and listening for noise. Dry silicon carbide components may make a chattering sound when the rotor is turned by hand. This is normal. If resistance or scraping is felt, or if crunching noises are heard (scraping, etc.), inspect the pump to determine the cause, and take corrective action. A faint clicking noise as the bushing bears against the anti-rotation set bolts is normal. The click will be heard only once each time the direction of rotation is changed.
18. Review the assembly procedure and make sure all steps were accomplished. The pump is ready to be returned to service or placed in stores inventory.

MPL PARTS LIST

ITEM	QT	DESCRIPTION	MAT'L
87	1	MOTOR SHAFT KEY	ASTM A575 1045
76	2	OUTER MAGNET SET SCREW M8 x 8L	ASTM A29 4135
67	4	HEX HEAD BOLT M12 x 35L	ASTM A283 GRADE.D
66	8	CASING HEX HEAD BOLT M12 x 30L	AISI 304
50	1	FRAME ADAPTER	ASTM A536 GR.60
48	1	OUTER MAGNET Nd	ASTM A536 GR.65
44	2	THRUST RING	SiC
43	2	SLEEVE	SiC
42	2	BUSHING	SiC
40	1	INNER MAGNET Nd	AISI 316
33	1	SHEET GASKET Ø205 x Ø219 x 1.5t	V7010/PTFE
16	1	INNER MAGNET KEY 5 x 5 x 52L	AISI 316
15	1	IMPELLER KEY 5 x 5 x 42L	AISI 316
14	1	SQ. HEAD PLUG 1/2" NPT	AISI 316
13	3	SET SCREW M6 x 6L	AISI 316
12	1	SLEEVE BOLT SET SCREW M6 x 8L	AISI 316
11	1	IMPELLER SET SCREW M6 x 8L	AISI 316
8	4	HEX SOCKET HEAD BOLT M8 x 20L	AISI 316
7	1	SLEEVE BOLT M14	AISI 316
6	1	IMPELLER NUT M18	AISI 316L
5	1	IMPELLER MAGNET SHAFT	AISI 316
4	1	REAR CASING	AISI 316
3	1	CASING COVER	ACI CF8M
2	1	CASING	ACI CF8M
1	1	IMPELLER	ACI CF8M

TABLE ABOVE INDICATES STANDARD MATERIALS OF CONSTRUCTION. ADDITIONAL MATERIALS ARE AVAILABLE AS OPTIONS. Contact your Magnatex representative or **MAGNATEX PUMPS INC.** (713-972-8666) for more information.

MPL SECTIONAL

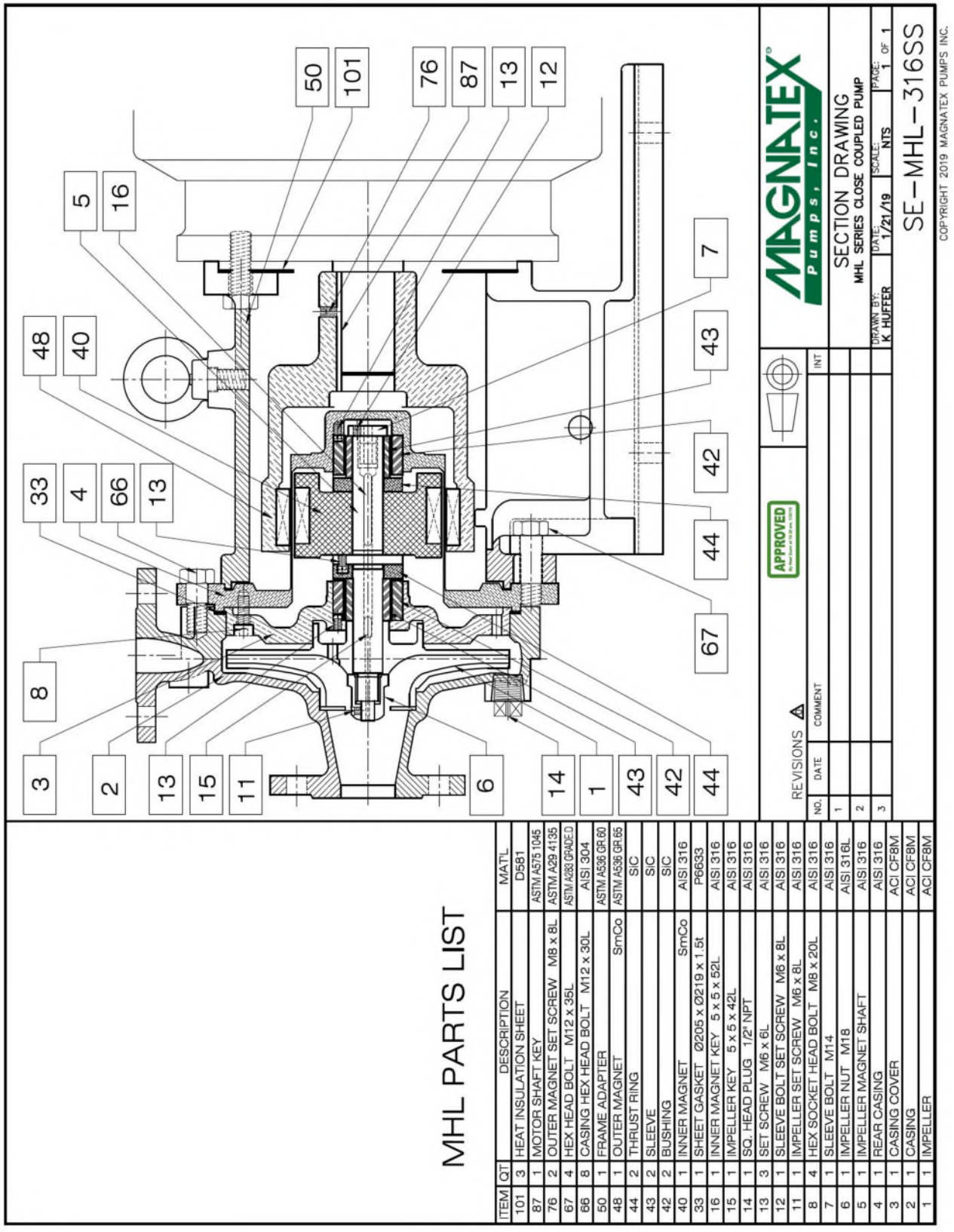


MHL PARTS LIST

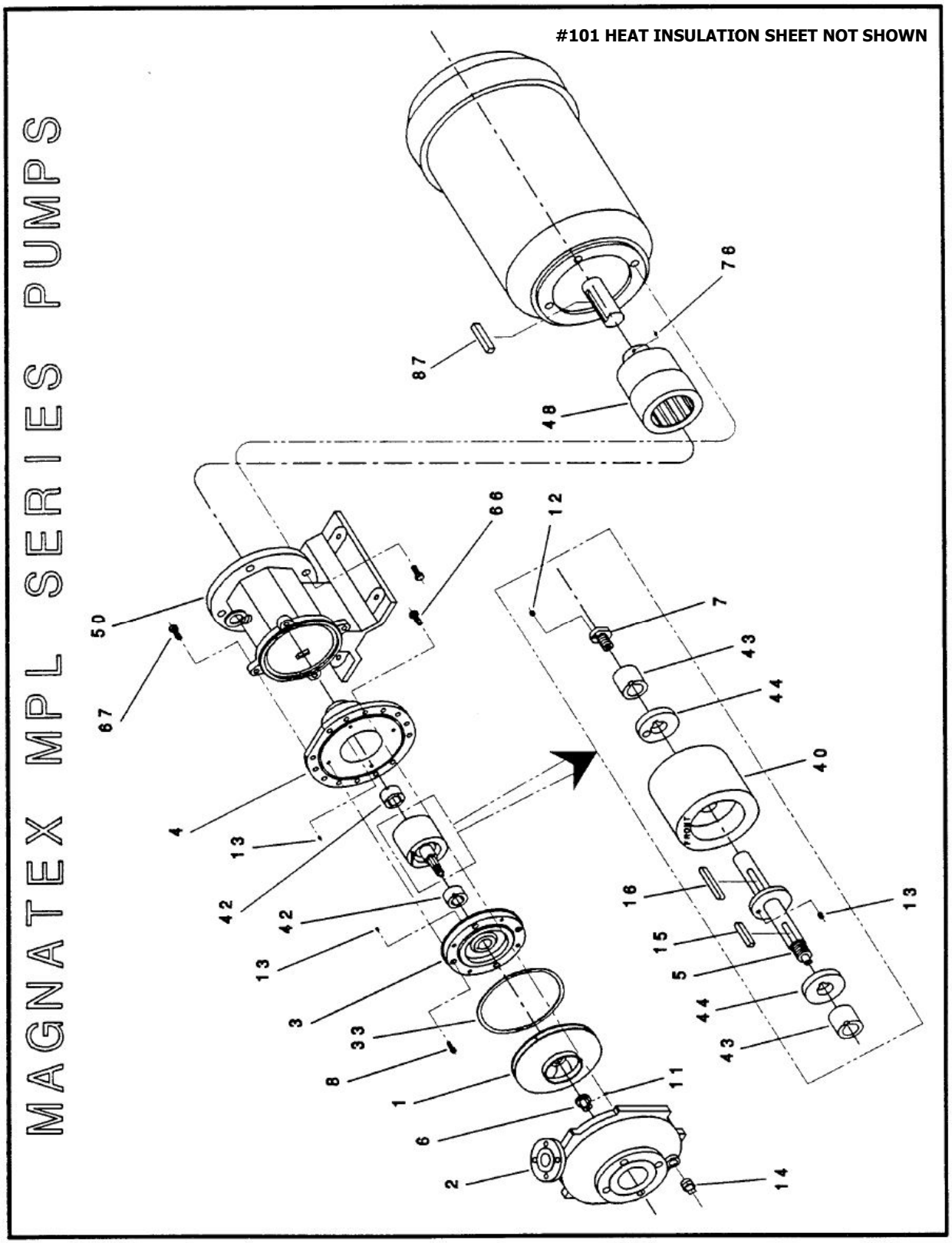
ITEM	QT	DESCRIPTION	MAT'L
101	3	HEAT INSULATION SHEET	D581
87	1	MOTOR SHAFT KEY	ASTM A575 1045
76	2	OUTER MAGNET SET SCREW M8 x 8L	ASTM A29 4135
67	4	HEX HEAD BOLT M12 x 35L	ASTM A283 GRADE.D
66	8	CASING HEX HEAD BOLT M12 x 30L	AISI 304
50	1	FRAME ADAPTER	ASTM A536 GR.60
48	1	OUTER MAGNET SmCo	ASTM A536 GR.65
44	2	THRUST RING	SiC
43	2	SLEEVE	SiC
42	2	BUSHING	SiC
40	1	INNER MAGNET SmCo	AISI 316
33	1	SHEET GASKET Ø205 x Ø219 x 1.5t	P6633
16	1	INNER MAGNET KEY 5 x 5 x 52L	AISI 316
15	1	IMPELLER KEY 5 x 5 x 42L	AISI 316
14	1	SQ. HEAD PLUG 1/2" NPT	AISI 316
13	3	SET SCREW M6 x 6L	AISI 316
12	1	SLEEVE BOLT SET SCREW M6 x 8L	AISI 316
11	1	IMPELLER SET SCREW M6 x 8L	AISI 316
8	4	HEX SOCKET HEAD BOLT M8 x 20L	AISI 316
7	1	SLEEVE BOLT M14	AISI 316
6	1	IMPELLER NUT M18	AISI 316L
5	1	IMPELLER MAGNET SHAFT	AISI 316
4	1	REAR CASING	AISI 316
3	1	CASING COVER	ACI CF8M
2	1	CASING	ACI CF8M
1	1	IMPELLER	ACI CF8M

TABLE ABOVE INDICATES STANDARD MATERIALS OF CONSTRUCTION. ADDITIONAL MATERIALS ARE AVAILABLE AS OPTIONS. Contact your Magnatex representative or **MAGNATEX PUMPS INC.** (713-972-8666) for more information.

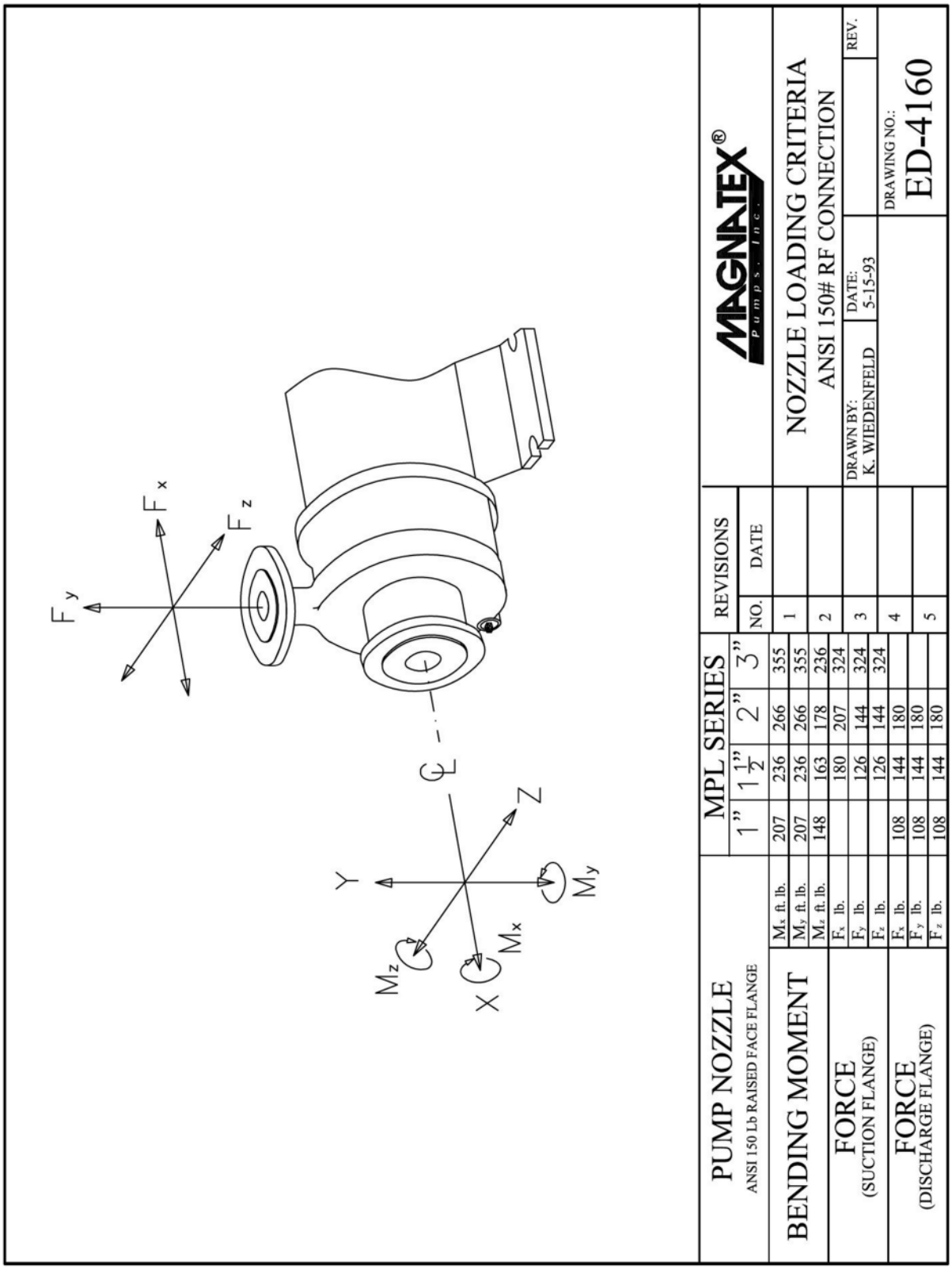
MHL SECTIONAL



MPL/MHL EXPLODED VIEW



MPL/MHL NOZZLE LOADING



PUMP NOZZLE ANSI 150 Lb RAISED FACE FLANGE		MPL SERIES				
		1"	1 1/2"	2"	3"	
BENDING MOMENT	M_x ft. lb.	207	236	266	355	
	M_y ft. lb.	207	236	266	355	
	M_z ft. lb.	148	163	178	236	
FORCE (SUCTION FLANGE)	F_x lb.		180	207	324	
	F_y lb.		126	144	324	
	F_z lb.		126	144	324	
FORCE (DISCHARGE FLANGE)	F_x lb.	108	144	180		
	F_y lb.	108	144	180		
	F_z lb.	108	144	180		

REVISIONS		
NO.	DATE	
1		
2		
3		
4		
5		

MAGNATEX® Pumps, Inc.

NOZZLE LOADING CRITERIA
ANSI 150# RF CONNECTION

DRAWN BY: K. WIEDENFELD
DATE: 5-15-93
REV.

DRAWING NO.: ED-4160

STATIC TORQUE TABLE
MINIMUM TORQUE VALUES
MPL/MHL PUMPS

MAGNET SIZE	MINIMUM TORQUE IN LB-FT [Nm]	
1 pound force foot = 1.35 Newton meter	NEODYMIUM (Nd) Maximum Temp Limit MPL 300°F [149°C]	SAMARIUM COBALT (SmCo) Maximum Temp Limit MHL 536°F [280°C]
V25	10.6 [14.3]	15.85 [21.5]
V40	21.1 [28.5]	31.70 [43]
V65	42.3 [57.1]	52.84 [71.6]

NOTES:

1. When handling magnets refer to caution statements on page 2 of this IOM.
2. In the pump model number, a magnet suffix of 'N' is for Neodymium, and 'H' is for Samarium Cobalt
3. Rounding to the nearest whole number to obtain torque value is acceptable. Torque value tolerance is +/- 5%.
4. When torque test fails as outlined in Torque Check on page 8 of this IOM typically the inner magnet must be replaced. Inspect the Outer Magnet for loose damaged or magnets. Remove any attracted metallic objects such as filings from magnets using high strength tape by patting/touching the affected surfaces with the adhesive side.