



HT-25, HT-50, HT-100

Heavy Duty Submersible Pumps

Installation, Operation & Maintenance Manual

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Table of Contents

1	Introduction	1
	1.1 General	1
2	Terms and Conditions	2
	2.1 Materials and Compatibility with Buyer's System or Process:	2
	2.2 Warranties:	2
	2.3 Exclusivity of Warranties:	3
	2.4 Limitation of Liability:	3
	2.5 Return of Goods:	3
	2.6 Arbitration:	4
	2.7 Governing Law:	4
	2.8 Exclusion of Liability for Oral Representations:	4
	2.9 Intellectual Property:	4
	2.10 Severability:	4
3	Installation	5
	3.1 Check upon Arrival	5
	3.2 Pre-start Preparations	5
	3.3 Installing the Pump	6
	3.4 Electrical	7
4	Operation	9
	4.1 Pre-start Checks	9
	4.2 Test Operation	9
	4.3 Operation	10
	4.4 Shut down	11
5	Storage	12
	5.1 General Instructions	12
	5.2 Short Term Storage (2 to 6 months)	12
	5.3 Long Term Storage (6 to 24 months)	12
6	Maintenance	13
	6.1 Regular Inspections	13
	6.2 Lubrication and Additional Maintenance	14
	6.3 Recommended Spare Parts	14
	6.4 Electrical Check (Megger Test)	15
7	Troubleshooting	17
8	Pump Assembly	19
	8.1 Motor Assembly	20
	8.2 Rotor Bearing Assembly	21
	8.3 Mechanical Seal Assembly	21
	8.4 Housing and Impeller Assembly	23

8.5 Suction Cover and Shim Assembly	24
8.6 Final Assembly	26
8.7 Adding Oil to Oil Chamber	27
9 Appendix	28
9.1 Bolt Torque Table	28
9.2 Technical Data Sheet – 60Hz.....	29
9.3 Technical Data Sheet – 50Hz.....	30
9.4 Customer Fill-in Data Sheet	31
9.5 Performance Curves.....	32
9.6 Wiring Diagram.....	38
9.7 Pump Dimensional Drawings, Assembly Drawings and Parts Lists.....	39

1 Introduction

1.1 General

Thank you for selecting a HEVVY-TOYO submersible pump.

In order to ensure that you receive the maximum benefit of this equipment, it is required that this **Installation, Operation & Maintenance Manual** be thoroughly read prior to use, and that all instructions be carefully followed.

The descriptions and instructions in this manual cover the standard design of the equipment and the variations for the range of models. This manual does not cover all the design details (see specific pump model drawings), nor does it provide for every contingency which may be encountered. If information cannot be found in this manual, contact the nearest Toyo branch office.

This pump has been designed to provide safe and reliable service. It is, however, both a pressure vessel and a piece of rotating machinery. The operator must exercise good judgment and proper safety practices to avoid damage to the equipment and surroundings to prevent personal injury. The instructions in this manual are intended for personnel with a general training in operation and maintenance of centrifugal pumps.

Toyo Pumps reserves the right to change the design, construction material of any part without incurring the obligation of installing such changes on pumps already delivered.

2 Terms and Conditions

By placing this piece of equipment into service you agree to the Terms and Conditions below. TPNA's acceptance to supply equipment is conditional upon the Buyer's and subsequent Owner's agreement that the Terms and Conditions set out below govern the relationship between the Manufacturer and Owner.

2.1 Materials and Compatibility with Buyer's System or Process:

Quotations and recommendations including, but not limited to, materials of construction and compatibility of the Goods with the Buyer's system and process are based on information supplied by the Buyer. The Buyer is responsible for final confirmation of the metallurgical suitability of the construction materials and compatibility of the Goods with the Buyer's system or process. By placing an order further to a quotation, the Buyer acknowledges and agrees that it has confirmed the metallurgical suitability of the construction materials and the compatibility of the Buyer's system and process with the Goods.

TPNA expressly disclaims any warranty that the Goods will be compatible with the Buyer's operating system or process, and that the construction materials are metallurgically suitable for the Buyer's purposes. In the event that the Goods are not compatible with the Buyer's operating system or process, and/or that the construction materials are not metallurgically suitable, the Buyer shall be responsible for the cost all changes in the Goods, and if the Buyer's order is cancelled, TPNA shall be reimbursed for all costs and expenses incurred and reasonable profit for performance executed prior to the date of such termination.

2.2 Warranties:

TPNA makes no warranties expressed or implied, other than the following:

- a) TPNA warrants its products to be free from defects in material and workmanship until the earlier of one year from the date of start of operation or use of the Goods or 18 months from the date of shipment to the original retail customer, provided no alteration has been made thereto after delivery.
- b) Any part or parts proven defective after inspection by and to the satisfaction of TPNA will be (at TPNA's option) adjusted or repaired or replaced free of charge, on return of such defective part(s) by the Buyer. The Buyer shall assume all responsibility and expense for removal, reinstallation, freight and any related duties or taxes in connection with the foregoing.
- c) TPNA shall not be liable and shall not have any obligation for fair wear and tear, seal failures, damage caused by vibration, failure to properly maintain, damage caused by operating without flow or adequate submersion, damage caused by corrosives, abrasives or foreign objects and other damage caused by the improper storage, handling, operation, or maintenance contrary to good practice or instructions in any manuals, or due to the fault, negligence, want of skill or wrongful acts of the Buyer, its employees, agents, contractors or suppliers.

- d) On equipment and materials furnished by TPNA, but manufactured by others, the Buyer shall accept in lieu of any liability or guarantees on the part of TPNA, the benefits of any guarantees (if any) that are obtained by TPNA from such manufacturers or vendors. The above warranties cease to be effective if the products are altered or repaired other than by persons authorized or approved by TPNA to perform such work. Repairs or replacement deliveries do not interrupt or prolong the term of the warranty. The warranties above cease to be effective if the Buyer fails to operate and use the products sold hereunder in a safe and reasonable manner and in accordance with any written instructions from the manufacturer.

2.3 Exclusivity of Warranties:

TPNA expressly disclaims to the full extent permitted by law all express, implied, statutory and other warranties, guarantees or representations, including, without limitation, the warranties of merchantability, fitness for a particular purpose, and non-infringement of proprietary and intellectual property rights. For further clarity, the parties acknowledge and agree that section 18 of the Sale of Goods Act, R.S.B.C. 1996, c. 410 is excluded from and inapplicable to this Agreement.

2.4 Limitation of Liability:

The liability of TPNA and its affiliates, including but not limited to TPNA LLC, and their respective directors, officers, employees, contractors, subcontractors and agents ("TPNA and Others") is limited to the repair, replacement or refund of the original purchase price actually paid by the Buyer for the particular Goods or Services which are the subject of the claim. Except as expressly provided in the foregoing, TPNA and Others will not be liable for any loss, damage or expense including, but not limited to, the following: bodily harm to any individual, loss of profits, revenue, interest, loss by reason of shutdown or non-operation, increased expense of operation of the equipment, loss of power system, cost of purchase or replacement power, or claims of Buyer or customers of Buyer for service interruption, or any special, indirect, incidental or consequential damages arising out of this contract or any breach thereof, negligence of TPNA and Others, the performance of the Services or defect in, failure of, or malfunction of the Goods furnished to the Buyer or the customers of the Buyer. TPNA and Others will not be responsible for any special, indirect, consequential or incidental damages or expense of any kind or nature, regardless of the cause, even if TPNA and Others have any knowledge regarding the probability of their occurrence.

2.5 Return of Goods:

No credit or refund will be permitted for Goods returned unless TPNA's prior written permission has been obtained. If accepted, returned Goods may be subject to a handling or restocking charge.

2.6 Arbitration:

If there is any disagreement, dispute or controversy (a "Dispute") between the parties with respect to any matter arising under this Agreement or the construction of this Agreement, then the Dispute shall be referred to and finally resolved by arbitration under the rules of the Commercial Arbitration Act, R.S.B.C. 1996, c. 55 by a sole arbitrator. The award of the arbitrator shall be final and binding upon each of the parties and shall not be subject to appeal or judicial review.

2.7 Governing Law:

This Agreement shall be governed by and interpreted in accordance with the laws in effect in the Province of British Columbia, and, subject to Article 14, the parties attorn to the courts of the Province of British Columbia for the resolution of any disputes arising out of this Agreement.

2.8 Exclusion of Liability for Oral Representations:

The Buyer acknowledges that none of TPNA, its affiliates or agents has made any oral or written representations, inducements, or promises that are not expressly contained in this Agreement. The Buyer acknowledges and agrees that ANY ORAL OR WRITTEN REPRESENTATIONS, INDUCEMENTS OR PROMISES MADE BY ANY FIELD OR BUSINESS CONSULTANT, SALESMAN OR OTHER CONTRACTOR OF TPNA OR ITS AFFILIATES ARE EXPRESSION OF OPINION ONLY AND ARE NOT BINDING ON TPNA OR ITS AFFILIATES UNLESS EXPRESSLY CONTAINED HEREIN. NEITHER TPNA NOR ANY OF ITS AFFILIATES IS LIABLE FOR ANY ORAL OR WRITTEN REPRESENTATIONS, INDUCEMENTS OR PROMISES MADE BY ANY FIELD OR BUSINESS CONSULTANT, SALESMAN OR OTHER CONTRACTOR OF TPNA OR ITS AFFILIATES UNLESS EXPRESSLY CONTAINED IN THIS AGREEMENT. This Agreement may be modified only in writing signed by the Buyer and an officer of TPNA. The Buyer acknowledges that any field or business consultant, salesman or other contractor of TPNA or its affiliates is not authorized to modify or change any term of this Agreement.

2.9 Intellectual Property:

Title to, ownership of and all intellectual property rights in, any facilities, designs, equipment, specifications, drawings, formulas, engineering notices, technical data, software, processes, documentation and information used in connection with TPNA's supply of the Goods or related services (the "Goods Components") shall be and remain with TPNA, or its suppliers or licensors. This Agreement does not grant to the Buyer any intellectual property or other rights or licenses in or to any Goods Components.

2.10 Severability:

If any provision of this Agreement is determined to be invalid, void or unenforceable, in whole or in part, such invalidity, voidance or unenforceability shall attach only to such provision or part thereof, and the remaining part of such provision and all other provisions thereof shall continue in full force and effect.

3 Installation

3.1 Check upon Arrival

The unit should be inspected upon arrival. If there are any product irregularities, contact HEVVY-TOYO immediately. Damage due to shipment should be reported to the carrier.

Care should be taken when unpacking and moving pumps. Rough handling of the pump can cause breakage. Make sure that any equipment used to lift the pump or any of its components is capable of supporting the weights encountered. Make sure that all parts are properly rigged before attempting to lift.

Take note of the pump model (with correct frequency and voltage) as per your order. Pump parts and accessories may be packed inside the shipping container or attached to skids in individual packages. Inspect all containers, crates and skids before discarding.

A copy of this instruction book as well as instruction sheets for other various components may be included in the shipment. Put these papers in a safe, accessible place for ready reference when required. It is important that the entire contents of this booklet be studied before installation.

3.2 Pre-start Preparations

1. Installation will require the following tools: AC voltmeter and ammeter (clamp type), meg-ohm meter, wrenches, and screwdriver.
2. If the pump is not in its fully assembled state or has parts missing, do not install the pump and contact Toyo for replacement parts.
3. Choose a location for the pump that is away from flammable or explosive materials. The pump should be located in an area where water levels will be sufficient at all times (see appendix drawings for minimum water level).



WARNING! Allowing the pump to operate with insufficient discharge head or a clogged strainer stand can result in excessive vibration, current draw and/or noise, which could cause electrical hazards and damage to the pump.

4. Using a meg-ohm meter check the motor's insulation resistance by taking a measurement between each power conductor of the cable and the ground conductor. Insulation resistance should be 1 M Ω or greater for new or newly repaired pumps with cable attached. For detailed instructions, refer to section 6.4 Electrical Check.
5. Ensure your power supply is within $\pm 5\%$ of its rated voltage.
6. Do not pump fluids other than what the pump was designated for without contacting Toyo first.



WARNING! Using the pump outside its temperature range could lead to electrical hazards or pump failure.

3.3 Installing the Pump

1. Lifting the pump can be done by securing a rope/chain to the eye bolts, ensuring not to drop or heavily impact the unit on contact.



Caution During placement, be aware of the weight and movement of the center of gravity of the pump as it can easily fall or cause damage.



WARNING! Never hold or suspend the pump by its cable. This could lead to electrical shorts, shock to personnel or fire if damaged.

2. Place the pump on a flat, clear surface for use in the upright position. A mounting block may be used if necessary to prevent the suction strainer from being submerged in mud.
3. Using suitable piping materials, arrange pump piping as directly as possible while preventing any load on the pump itself.
4. Any recoil from the pump starting up should be able to be taken by the piping.
5. Avoid getting welding sparks and paint on the pump when making connections.
6. Avoid submerging the outlet of the discharge piping to prevent backflow when the pump stops.

3.4 Electrical

1. Choose qualified personnel to perform all electrical wiring **according to local rules and regulations**.



WARNING! Failure to abide by standard practices by qualified electricians may risk safety and lead to breaking regulations.

- a. The pump must be outfitted with appropriate breakers and overload protectors per local rules and regulations to prevent electrical shock and/or pump damage.
 - b. If unsure of the recommended breaker and overload protection settings for your pump, contact your local Toyo representative.
2. Properly ground the pump prior to usage, making certain not to attach the grounding wire to gas/water pipes, telephone ground wires, or lightning arrestors.



WARNING! Improper grounding could result in electrical shock.

3. Disconnect all power supplies to the pump before any wiring or maintenance activities. Source of power should be from a non-shared, dedicated power source rated for the pump current.



Caution If power is not disconnected prior to electrical setup or the source power is shared with other equipment, this may lead to unforeseen accidents and hazards such as shock and fire.

4. To connect the cabtyre cable, connect all the leads to the terminals of the control panel. Avoid excessive twisting, bending or impact of the cable and the individual wires to prevent damage.



WARNING! If the cabtyre cable becomes damaged or cut it may cause electrical hazards or fire.

5. If the cabtyre cable requires extending, use a conductor size equal to or greater than the previous cable to maintain performance and prevent overheating. For length longer than a total cable length of 100 feet consult your cable supplier or Toyo to confirm line voltage drop is less than 5% total.



WARNING! If the cabtyre cable overheats it may lead to electrical hazards or fire.

6. Keep the power supply and cabtyre cable away from water. If the cabtyre cable needs to be submerged in water, make certain there is no damage to the insulation and any splices are completely sealed and protected from water damage.



WARNING! Stop using the pump if there is wear/handling damage or water damage to the cabtyre cable. This may lead to hazards such as shock and fire.

4 Operation

4.1 Pre-start Checks

1. Double check that the frequency and voltage ratings are correct for the pump model.



Caution

Using incorrect power ratings may lead to damage of the pump as well as lower performance and efficiency.

2. Double check the rating for the breaker and overload protection (in accordance with rated current of pump) and verify insulation resistance (should be greater than or equal to 1 MΩ for a pump with cable attached).
3. When powering the pump with a generator, do not share the generator with other equipment.

4.2 Test Operation



WARNING!

If testing while suspended in midair, special attention should be paid to stay clear of the discharge piping. Extreme caution should be exercised. The recoil that occurs on startup can result in accidents or damage to unit or nearby objects.

1. Bump start the pump. Check that the direction **of rotation is counterclockwise when viewed from the suction end** (ie. correct recoil on starting is counterclockwise when viewed from the top).



WARNING!

These pumps will pump a significant fraction of rated performance running backwards. The fact that the pump is pumping does not verify correct rotation.



WARNING!

The pump rotation check should never be done while submerged. If the impeller is rotating in the reverse direction while in water it could damage the pump.

2. If the direction of rotation is incorrect, interchange connections between any two leads U, V, or W.



WARNING!

Remember to turn off power supply circuit breaker and ensure the pump has completely stopped prior to performing any rewiring.

3. Submerge the pump to the recommended minimum submergence (see outline drawing in appendix) and allow it to run for 2 to 5 minutes. Measure the voltage (within $\pm 5\%$ rated voltage) and the operating current for leads U, V and W.
 - Refer to nameplate data. If voltage exceeds tolerance levels, re-check power supply.
 - Refer to nameplate data. If current exceeds the rated value overloading the motor is the likely reason, check pump specifications.
4. Stop the test operation of the pump if abnormal sounds, vibration or odor result and contact Toyo immediately. If no problems arise, allow the pump to continue under operation.

**Caution**

Allowing the pump to operate under such non-desirable conditions may result in electrical hazard or damage.

4.3 Operation

1. If no abnormal occurrences happen during the test, continue as fully operational.

**Caution**

With continued use, the pump may become hot, avoid contact.

**Caution**

Start stop frequency must be limited to **four** times per hour for all sizes up to 200 HP, and limited to **two** times per hour for sizes between 200 and 500 HP.

2. Start the pump in clear fluid to prime the discharge hoses/piping. Ensure that no hoses are kinked as the pump may not be able to force them open to start flow. Where flexible hose is required use non-collapsible hose.
3. Lower the pump slowly into the material being pumped.
4. Slurry density can be observed by watching an ammeter for current loading. Higher current means higher specific gravity and thus higher density.
5. Slurry density can often be controlled by raising and lowering the pump into the material.
6. The hose must be sized carefully to ensure suitable settling velocities in the line, or plugging could occur. Make sure that the discharge hose is not bent or folded as this will cause a decrease in pump output. Always use the shortest possible length of hose.

4.4 Shut down

1. Prior to pump shutdown lift the pump into clear fluid for several minutes to completely flush the system of any slurry.



Caution

Never stop the pump while pumping slurry through the lines as there is a risk the lines will plug and the pump will be buried.

2. After shutdown, to keep the pump in good condition and maintain high pumping efficiency, clean out any solids (i.e. sand, mud, etc.) which may have been collected in the pump casing or around the strainer stand.
3. For storage after use, the pump should be stored in a dry warehouse after cleaning both the inside and outside of the pump thoroughly. See **Section 5** for short and long term storage instructions.

5 Storage

5.1 General Instructions

The pump is protected against corrosion for the period of shipment and installation only.

If the pump is not to be installed right away, find a clean, dry location for storage indoors. The unit should be stored in an approximately level position with no strains applied. Protective coverings should be left in place. The pump can be left in its shipping container or skid for storage. The unit is shipped with oil and grease filled.

If the pump has been in use before, make sure the unit is cleaned and dried completely prior to putting it in storage.

5.2 Short Term Storage (2 to 6 months)

- Store the pump in an upright position in a dry place.
- Support all electrical cables to prevent stress and distortion at the electrical connection on-top of the pump motor.

5.3 Long Term Storage (6 to 24 months)

- Store the pump in an upright position in a dry place.
- Pump should be stored in a temperature controlled room.
- If excessive humidity is present, use moisture-absorbing desiccant near the center of the pump. Spray all exposed parts with rust-inhibiting oil.
- Suitable covers out of plywood or plastic must be installed on the suction and discharge flanges and any other openings on auxiliary equipment to provide adequate protection against dirt, dust and nesting animals.
- Rotate the pump once per month by hand to re-lubricate the bearing surfaces.

6 Maintenance

Regular inspections and maintenance should be done in order for the pump to continue running efficiently and provide a long service life. The pump's internal sensors should also be monitored during operation.

6.1 Regular Inspections

1. Turn off the power and disconnect the pump's cabtyre cable from the power source.



WARNING! All electrical work must be performed by qualified personnel.

2. Clean the pump with water, removing any dirt or fragments that may have collected within the impeller or other crevices.
3. A general inspection should be done to make sure there are no cracks, no loose bolts or any other obvious abnormalities.
4. The following is an inspection schedule listing items to check on a regular basis. See the section on Spare Parts for spares/replacements.

Schedule	Maintenance to be performed
Daily	<ul style="list-style-type: none"> • Remove excessive accumulations of dirt on the motor. • Check for abnormal noise or vibration.
Weekly	<ul style="list-style-type: none"> • Check values for voltage, current, and insulation resistance with rated values. Supply voltage: ±5% rated value Operating current: compare with rated value Insulation resistance: Must be 1MΩ or greater for pump with cable attached. Record value. Any change from previously recorded value should be minimal otherwise inspection of the motor may be required.
Monthly	<ul style="list-style-type: none"> • General inspection of pump efficiency. • Check for plugging or wear of the impeller which may reduce performance significantly. • Check clarity of oil and oil level (see Lubrication Section).
Yearly or 4000 Hrs (earlier of two)	<ul style="list-style-type: none"> • Change oil and re-grease bearings if applicable (see Pump Lubrication in appendix).
Every 1-2 Years depending on severity of service	<ul style="list-style-type: none"> • Recommended OEM authorized inspection. • Consult Toyo for seal refurbishment/replacement if necessary.
Out of Use	<ul style="list-style-type: none"> • Clean and dry the pump for indoor storage. • Rotate once a month by hand.

6.2 Lubrication and Additional Maintenance

1. For details on approved oil and grease for pump lubrication, see Appendix.
2. **Always tailor lubrication intervals to your application specific requirements.** If pump is run intermittently, the oil reservoir should be examined more often.
3. If the pump has not been operated for a long period of time, the oil reservoir should be examined shortly after startup to ensure there has been no deterioration of seals.

6.3 Recommended Spare Parts

To ensure against possible long and costly downtime periods, especially on critical services, it is advisable to have spare parts on hand. A list of spare parts is found in the Parts List (see Appendix). Repair orders will be handled with minimal delays if the following directions are followed:

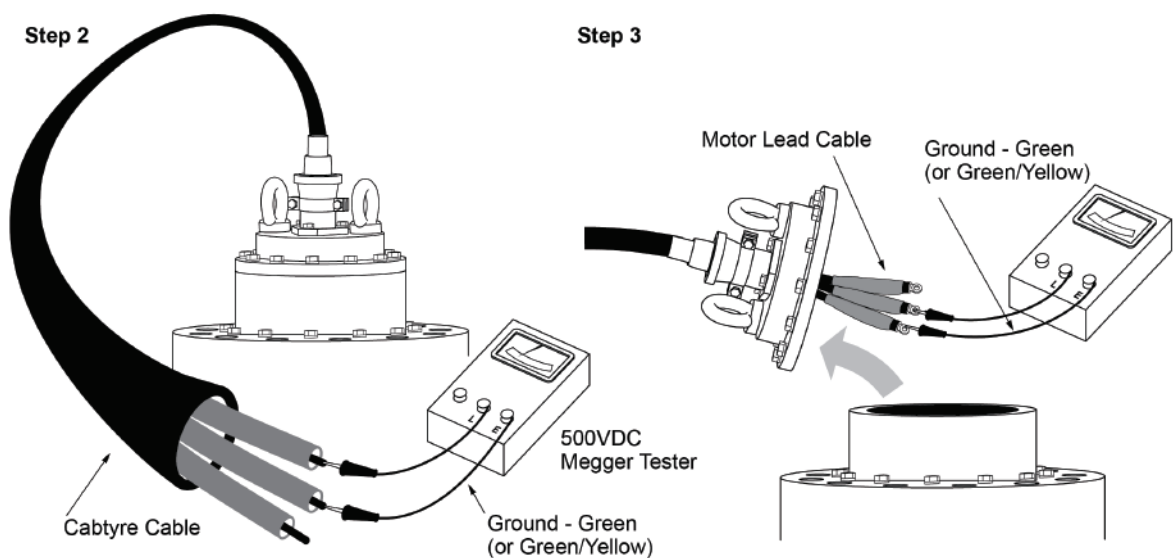
1. Give model number and serial number. These can be obtained from the nameplate on the pump.
2. Write the name and part number of each part required. These names and numbers should agree with those on the sectional drawings.
3. Give complete shipping instructions.

Some parts have long service lives and therefore do not have to be carried in stock. These items should be checked at regular intervals, and when replacement is indicated, the parts should be ordered.

6.4 Electrical Check (Megger Test)

Whenever the pump is serviced the following test should be performed to check the insulation resistance of the motor and cable.

1. Disconnect the cabtyre cable from the power source.
2. Verify continuity between the cable ground conductor and the motor frame.
3. Test the motor and cable assembly. Using the 500 VDC Megger Tester, check the electrical insulation resistance between the cable ground conductor (green) and each power conductor in turn.



4. Any reading less than 1 meg-ohms ($M\Omega$) indicates damage to the cabtyre cable and/or the motor.
5. If any reading is less than 1 meg-ohms ($M\Omega$), disconnect the cabtyre cable from the motor and Megger Test the insulation resistance of the motor itself in the same manner as above.
6. If all motor readings are more than ten (10) meg-ohms ($M\Omega$), it indicates the problem is in the cable and requires immediate replacement of the Cabtyre Cable.

7. Any motor reading less than ten (10) meg-ohms ($M\Omega$) indicates damage in the motor in which case the motor must be checked by a qualified repair facility.



Caution: It is very important that appropriate corrective action/repair be performed before the pump is returned to service if it does not pass the Megger Test.



WARNING! Serious personal injury can result from electrical shock.

Note: The above maintenance inspection, if it is performed regularly, will result in greatly improved pumping efficiency and pump life.

7 Troubleshooting

Problem	Possible Causes and Solutions
Pump will not start.	The power has not been turned on.
	Fuse or circuit breaker blown.
	The power supply is inadequate.
	The motor is burned out or is burning out.
	The cabtyre cable has been incorrectly connected. See section on Electrical.
Pump's motor overload protection system stops the pump right after startup.	Debris between the rotating and stationary elements requires cleaning.
	The voltage may be too low and not in accordance to the rated voltage. (Or the cabtyre cable has been extended with an improper gauge cable).
	The power supply/frequency does not match the pump nameplate. Replace the power supply.
	The motor may be faulty and need replacing. See section on Electrical Check.
	Too much solid material is being sucked into the pump. Raise the pump into clear liquid and lower slowly into the solids.
Pump requires excessive power.	Specific gravity of liquid higher than design.
	Viscosity of liquid differs from that for which designed.
	Total system head is lower than pump design head resulting in too much flow.
	For pumps without water jackets, there is insufficient submergence for motor cooling.
	Where applicable, impeller front or back axial running clearance set too tight.
	Excessive bearing lubricant or lack of cooling causing excessive bearing temperatures.
Lift or discharging capacity is low.	The impeller is excessively worn and needs replacement.
	The discharge piping is partially clogged. Raise the pump into relatively clear water and flush the piping. (Avoid stopping the pump without flushing the piping with relatively clear water.)
	The discharge valve is closed or incorrectly set.
	The discharge hose is kinked.

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Problem	Possible Causes and Solutions
Lift or discharging capacity is low.	The suction strainer is clogged and requires cleaning of debris. The pump may be placed on a mounting block to reduce clogging.
	The motor direction is reversed. See sections on <i>Electrical</i> and <i>Test Operation</i> for interchanging leads.
	The pump is not completely filled with liquid or there is an excessive amount of gas entrained in the liquid.
Excessive noise and vibration.	The motor shaft or bearings are worn or damaged and need replacement.
	Resonance of piping system.
	Operation at low capacity.
	Rust on bearings due to water getting into housing.
	Brinelling of bearing races due to high ambient vibration produced by nearby equipment or long storage.
	Insufficient oil in seal housings.
	Incorrect bearing lubricant used.
	Contaminated lubricant.
	Impeller loose on shaft due to improper assembly.
	Impeller or rotor damaged and out of balance.
One or more impeller vanes clogged.	

Table 1: Troubleshooting

8 Pump Assembly

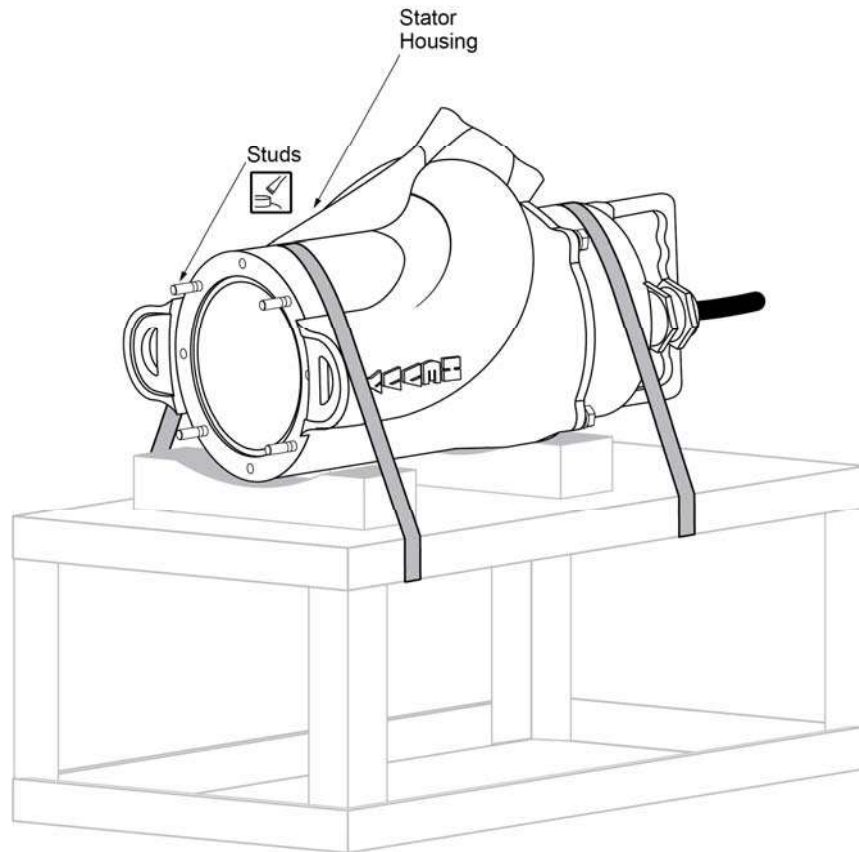
Inspect and inventory all parts before you begin assembly. Clean the parts and remove any burrs as required. Assembly should be performed in a clean, dust free area. Read instructions and drawings before you begin.

Note: This manual covers the entire **HT** line. It is to be used for general assembly, installation, operation & maintenance. For specific part numbers for your model, refer to the parts list and schematics found in the **Appendix**.

Symbol	Action
	Apply small amount of Loctite Anti-Seize or similar anti-seize compound to screws and bolts.
	Apply small amount of Loctite or similar thread-locking compound.
	Coat all O-rings with silicone grease (Dow Corning 111) prior to installation.
	All fasteners to be tightened as per the torque table in the Appendix unless otherwise specified.
	Rotation direction

8.1 Motor Assembly

1. Ensure the **Stator Housing** is secured to proper work bench.
2. Attach the studs to the Stator Housing.



8.2 Rotor Bearing Assembly

1. Slide the **Bearing Cover** onto the **Rotor** assembly.
2. Preheat both **Inboard** and **Outboard Bearings** to 110–115 °C (230–240 °F) in an induction heater, oven, or oil bath.

Note: An induction heater will have the best results for even heating.

3. Slide the bearings onto the shaft. Position the bearing race against the shaft shoulder and hold it in place while the race cools.



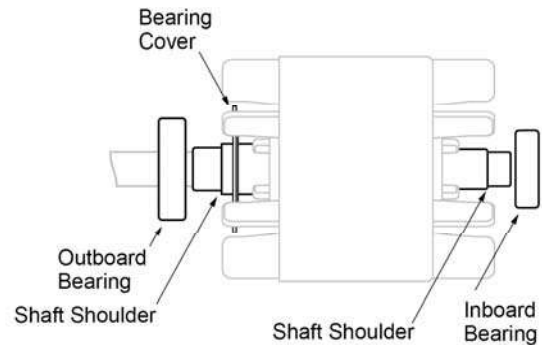
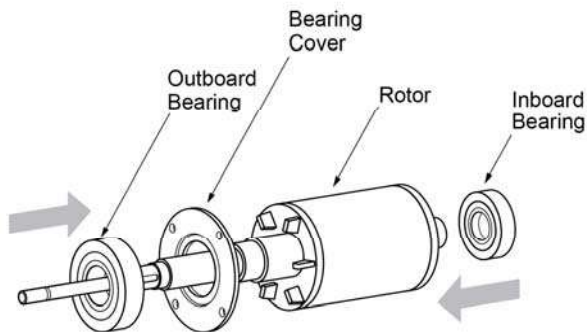
Caution

Never use an open flame to heat bearings.



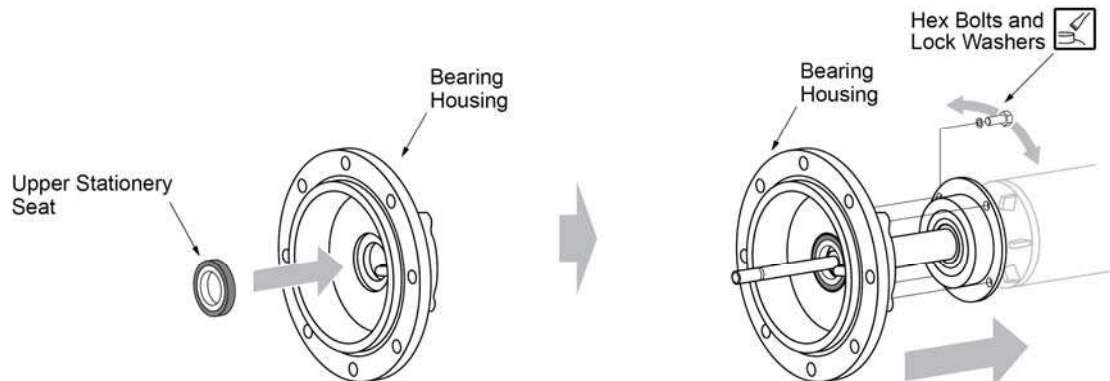
Caution

Do not heat any bearing above 150 °C (257 °F) or permanent changes to the bearing material may occur. Always wear fireproof insulated gloves when handling heated component.

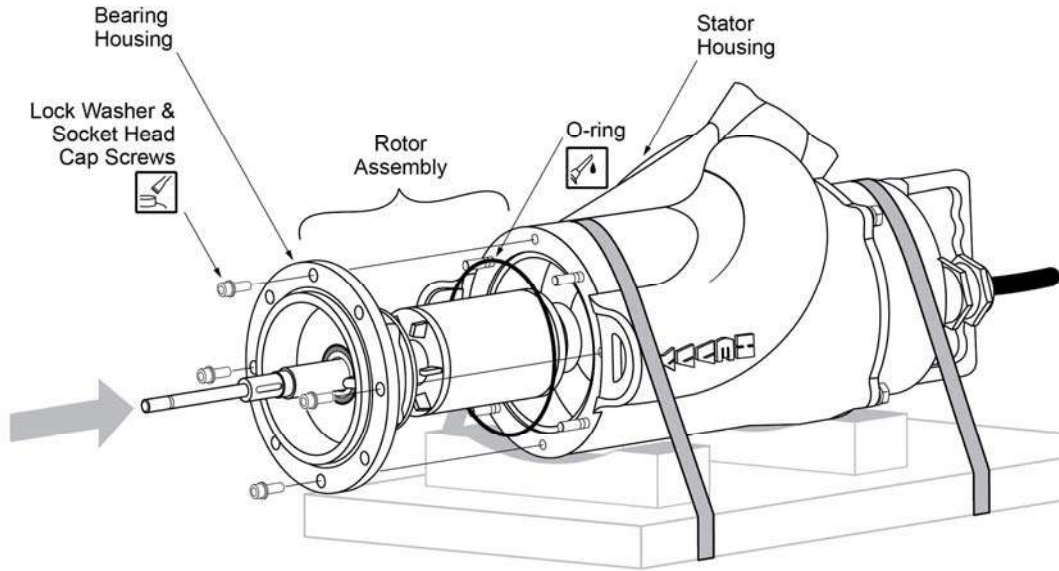


8.3 Mechanical Seal Assembly

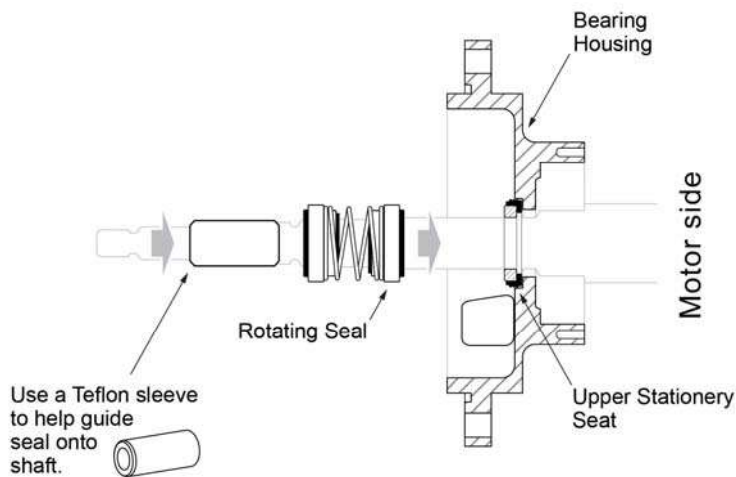
1. Press the **Upper Stationery Seat** into the **Bearing Housing**. Carefully clean all seal faces with alcohol and lint-free wipes.
2. Attach the Bearing Cover to Bearing Housing with hex bolts and lock washers.



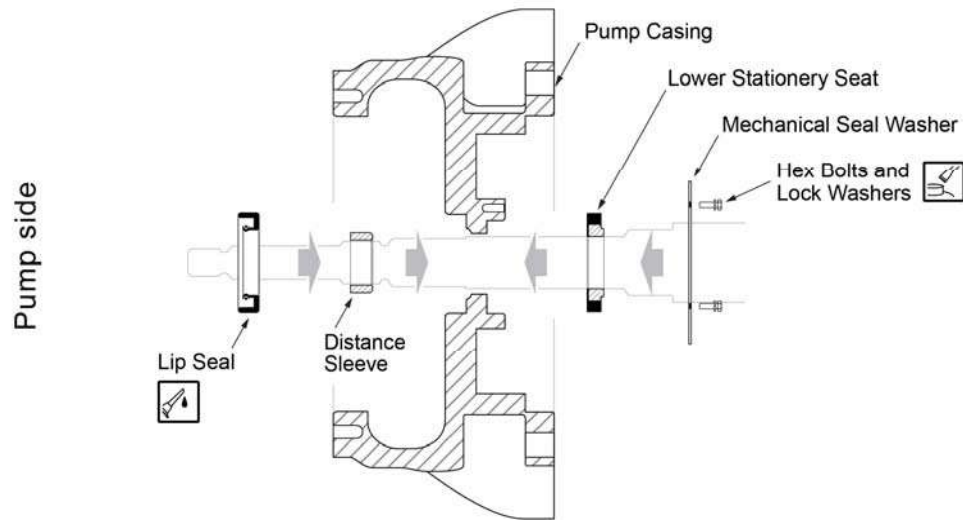
3. Attach **O-ring** to the Stator Housing.
4. Apply a thin coat of grease to the Inboard Bearing. Insert the **Rotor Assembly** into the Stator Housing. **Note:** Ensure bearing is seated properly.
5. Attach the Bearing Housing to the Stator Housing with socket head cap screws.



6. Attach the **Rotating Seal** component.

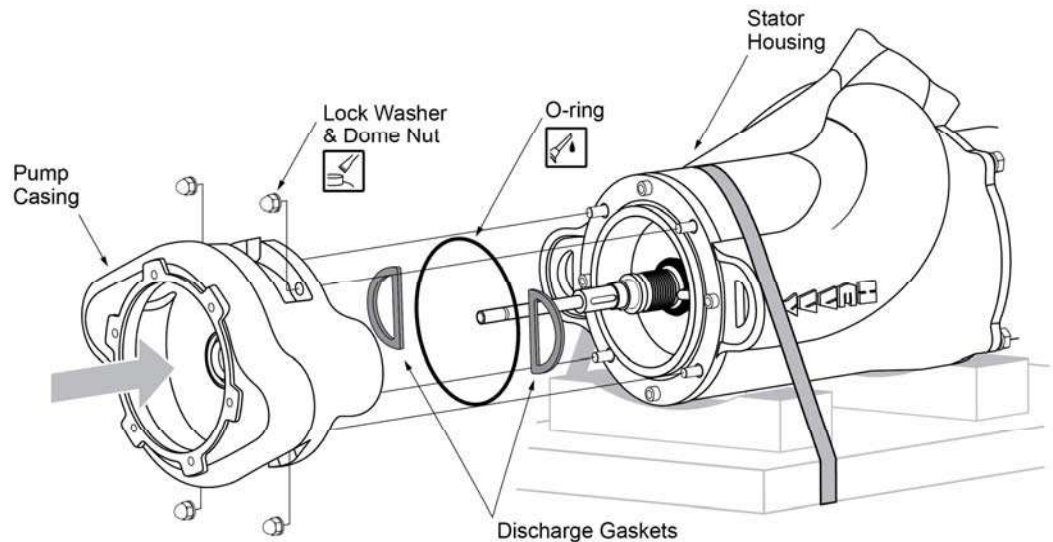


7. Attach the **Lower Stationery Seat** onto the **Pump Casing**.
8. Attach the **Mechanical Seal Washer** to Pump Casing using hex bolts and lock washers. This will hold the Lower Stationery Seat in place.
9. Attach the **Distance Sleeve**. Make sure it fits tight between the shaft and the Lip Seal.
10. Attach the **Lip Seal** into the **Pump Casing**. Ensure proper direction.

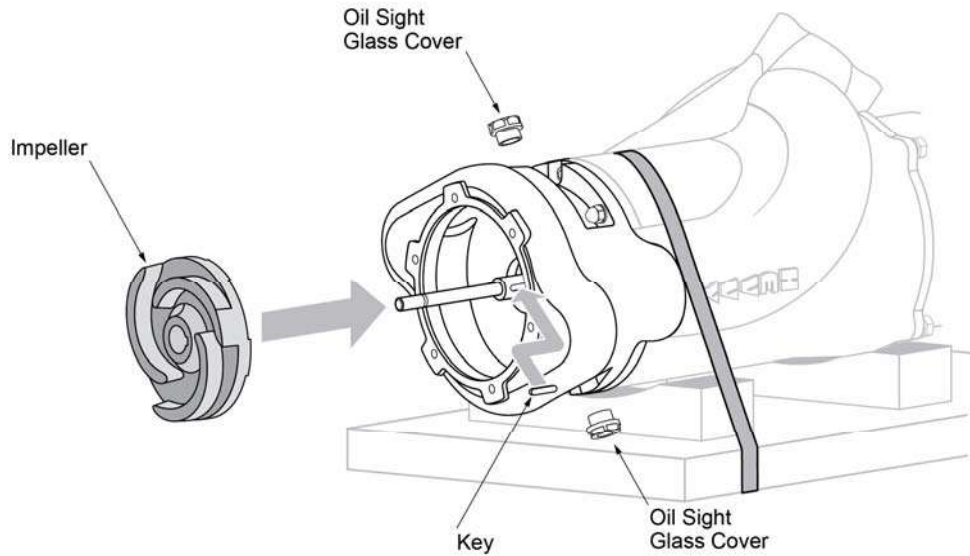


8.4 Housing and Impeller Assembly

1. Attach **O-ring** and **Discharge Gaskets** to the Stator Housing assembly.
2. Attach the Pump Casing to the Stator Housing using lock washers and dome nuts.

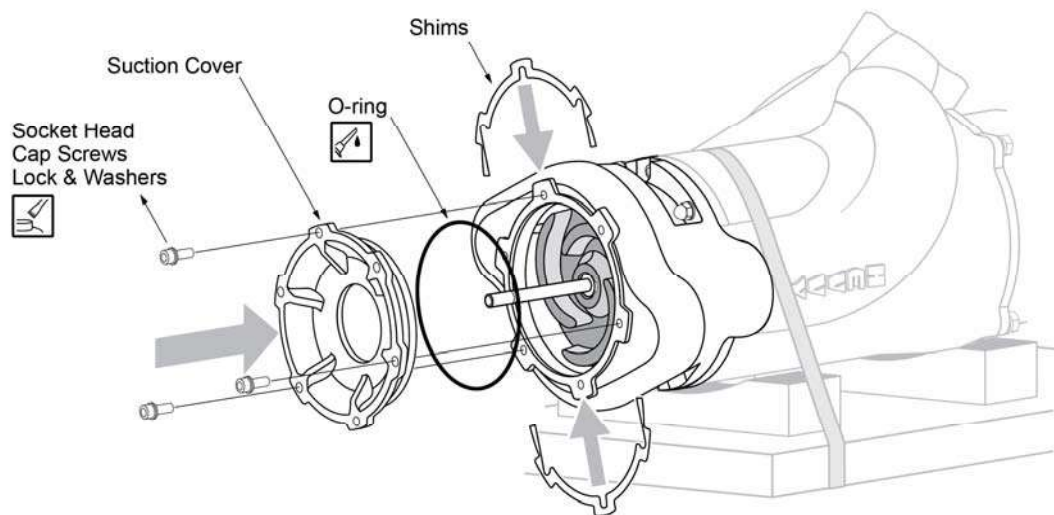


3. Attach the two **Oil Sight Glass Covers** – one on each side of the pump.
4. Attach the **Key** into the **Keyway**.
5. Attach the **Impeller**.

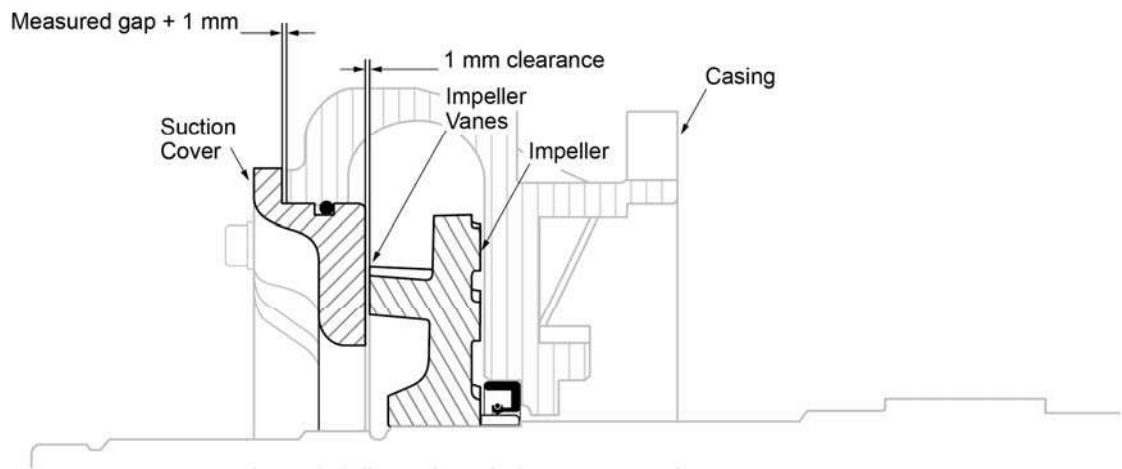


8.5 Suction Cover and Shim Assembly

1. Attach the **Suction Cover** to the Pump Casing with lock washers and socket head cap screws.

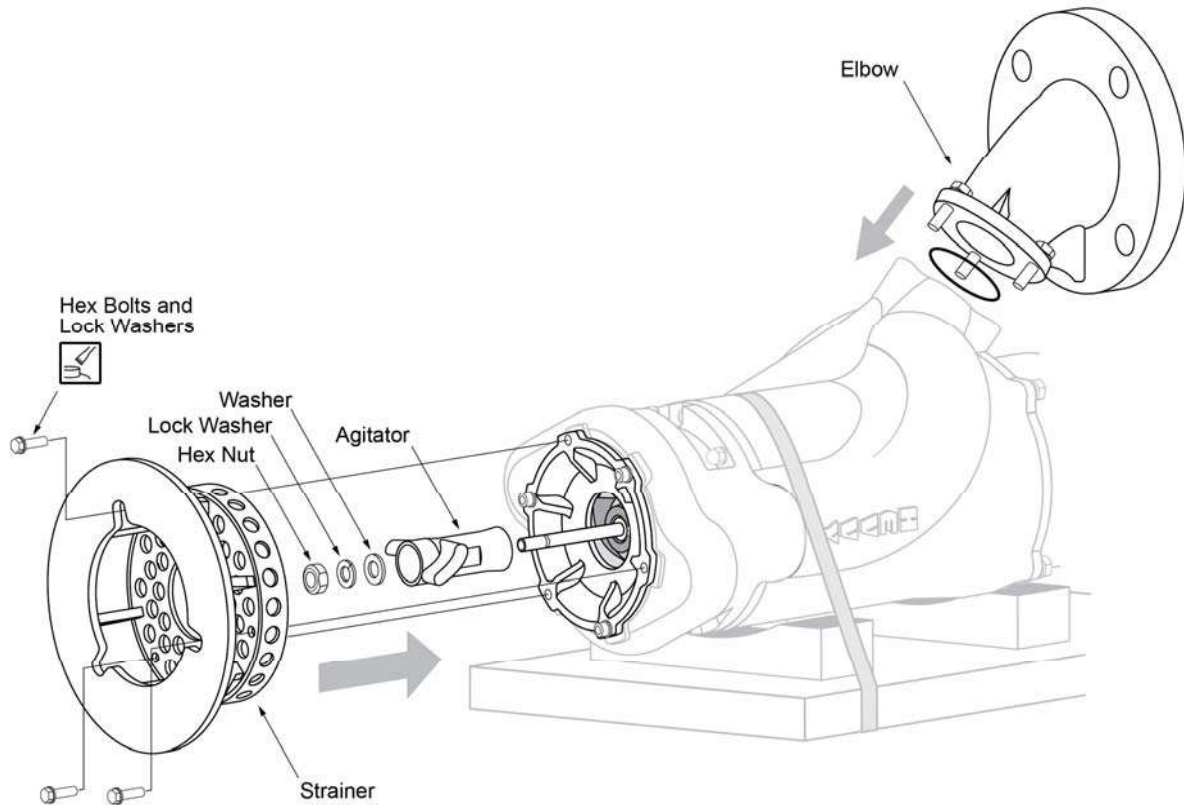


2. Tighten the Suction Cover firmly against the Pump Casing until it makes contact with the impeller vanes. Measure the **remaining gap** between the Suction Cover and the Pump Casing.
3. Make up a **Shim Pack** to get as close as possible to the measured gap.
4. Add an additional **1 mm** to the Shim Pack from **Step 3** to give you the appropriate impeller clearance.
5. Slide two equal Shim Packs between the Pump Casing and the Suction Cover to achieve impeller clearance of **0.5–1.5 mm**.
6. Once the Suction Cover is firmly installed, double check the impeller running clearance.



8.6 Final Assembly

1. Attach the **Agitator**.
2. Attach the **Washer**, **Lock Washer**, and **Hex Nut**.
3. Attach the **Strainer**.
4. Attach the **Discharge Elbow** with lock washers and hex bolts.



8.7 Adding Oil to Oil Chamber

Use the table below to determine the correct quantity of oil to use for your pump. Toyo Pumps come assembled with **MOBIL SHC 624** Synthetic Bearing and Gear Oil. Use this oil or similar **ISO VG 32** oil to refill chambers.

Pump Model	Oil Capacity	
	mL	Fluid Ounces
HT-3	275	9.3
HT-5	350	11.8
HT-7.5	650	22

Table 2: Oil Chamber Capacity

9 Appendix

9.1 Bolt Torque Table

Nominal Diameter Coarse Thread	Grade 8.8 Nm [lb-ft]	Grade A4-70 Nm [lb-ft]
M4	3.10 [2.29]	
M5	6.15 [4.54]	
M6	10.5 [7.7]	
M7	17.5 [12.9]	
M8	26 [19]	
M10	51 [37]	
M12	89 [65]	
M16	215 [158]	
M20	420 [309]	
M24	725 [534]	544 [400]
M27	1070 [789]	803 [590]
M30	1450 [1069]	1088 [800]

TOYO PUMPS NORTH AMERICA CORPORATION

9.2 Technical Data Sheet – 60Hz

Pump Data			
Pump Model	HT-3	HT-5	HT-7.5
Discharge Diameter (in.)	3	3	4
Flow at rated point (USgpm)	64	100	256
Head at rated point (ft)	39	58	47
Impeller Diameter (in.)	4.33	5.12	8.07
Impeller No. of Vanes	3	3	3
Max. Solid Size (in.)	0.47	0.59	1.18
Rated Output (HP)	3	5	7.5
No. of Phases	3	3	3
No. of Poles	2	2	4
Standard Seal	Dbl. Mech. Seal	Dbl. Mech. Seal	Dbl. Mech. Seal
Oil Capacity (oz)	9.3	11.8	22
Number of Bearings	2	2	2
Rated Speed (rpm)	3440	3440	1740
Rated Voltage (V)	460 / 575	460 / 575	460 / 575
Rated Current (A)	4.3 / 3.5	6.7 / 5.3	10.2 / 8.3
Insulation Class	F	F	F
Motor Thermal Protector	Standard	Standard	Standard
Starting Method	D.O.L.	D.O.L.	D.O.L.
Safety Factor	1.15	1.15	1.15
Power Cable(s)	SOOW 4c - 16	SOOW 4c - 16	SOOW 4c - 16
Pump Casing Material	Ductile Iron	Ductile Iron	Ductile Iron
Impeller Material	25% High Chrome	25% High Chrome	25% High Chrome
Suction Cover Material	Ductile Iron	Ductile Iron	Ductile Iron
Agitator Material	25% High Chrome	25% High Chrome	25% High Chrome

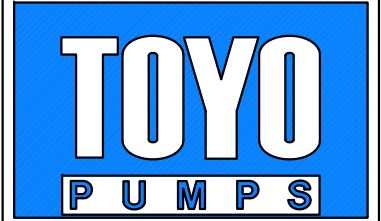
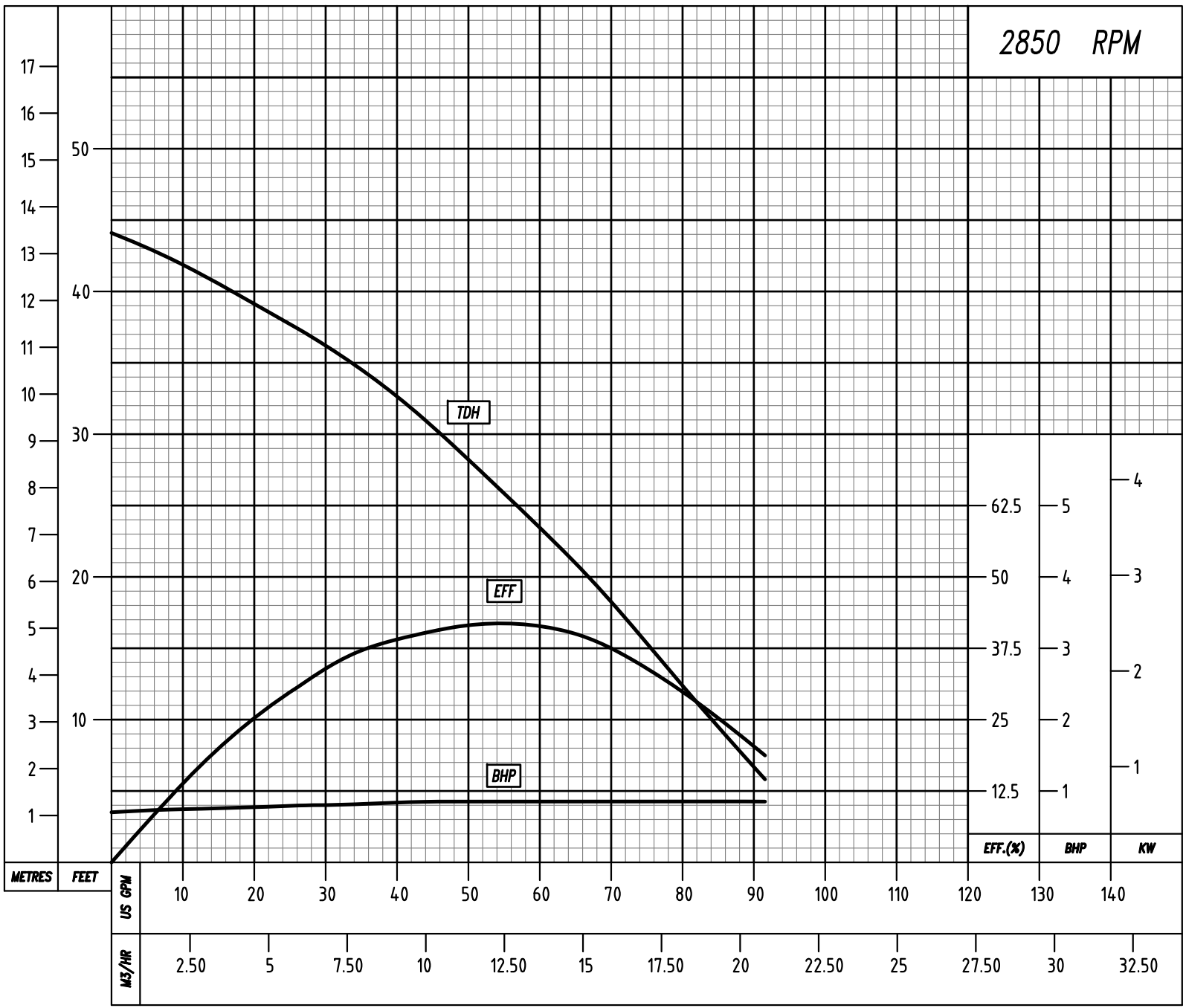
9.3 Technical Data Sheet – 50Hz

Pump Data			
Pump Model	HT-3	HT-5	HT-7.5
Discharge Diameter (mm)	80	80	100
Flow at rated point (m ³ /hr)	12	18	48
Head at rated point (m)	8	12	10
Impeller Diameter (mm)	110	130	205
Impeller No. of Vanes	3	3	3
Max. Solid Size (mm)	12	15	30
Rated Output (HP)	3	5	7.5
No. of Phases	3	3	3
No. of Poles	2	2	4
Standard Seal	Dbl. Mech. Seal	Dbl. Mech. Seal	Dbl. Mech. Seal
Oil Capacity (ml)	275	350	650
Number of Bearings	2	2	2
Rated Speed (rpm)	2840	2840	1440
Rated Voltage (V)	380	380	380
Rated Current (A)	5.1	8.0	13.6
Insulation Class	F	F	F
Motor Thermal Protector	Standard	Standard	Standard
Starting Method	D.O.L.	D.O.L.	D.O.L.
Safety Factor	1.15	1.15	1.15
Power Cable(s)	SOOW 4c - 16	SOOW 4c - 16	SOOW 4c - 16
Pump Casing Material	Ductile Iron	Ductile Iron	Ductile Iron
Impeller Material	25% High Chrome	25% High Chrome	25% High Chrome
Suction Cover Material	Ductile Iron	Ductile Iron	Ductile Iron
Agitator Material	25% High Chrome	25% High Chrome	25% High Chrome

9.4 Customer Fill-in Data Sheet

Start-up Operating Conditions	Customer Data	
	Metric	Imperial
Flow (USPGM) Normal		
Maximum		
Minimum		
Discharge Pressure (PSI)		
Slurry S.G.		
Solids % by volume		
Maximum particle size (In.)		
Temperature (°F)		
pH		
Start-up Pump Data		
Pump Speed (RPM)		
Power Draw (Amps)		
Oil Temperature (°F)		
Notes		

2850 RPM



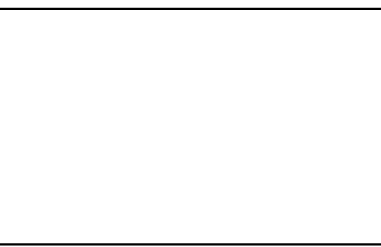
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TOYO PUMPS NORTH AMERICA CORPORATION
 BURNABY, BRITISH COLUMBIA
 CANADA V5C 6H2
 TEL : (604)298-1213 FAX : (604)298-7773

PUMP MODEL	HT-25		
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EFFECTIVE DATE	19 SEP 2016		
SUPERSEDES	-	REV.	1

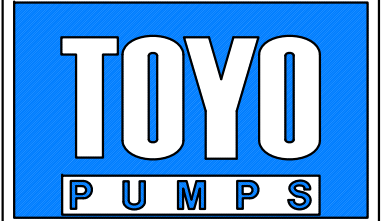
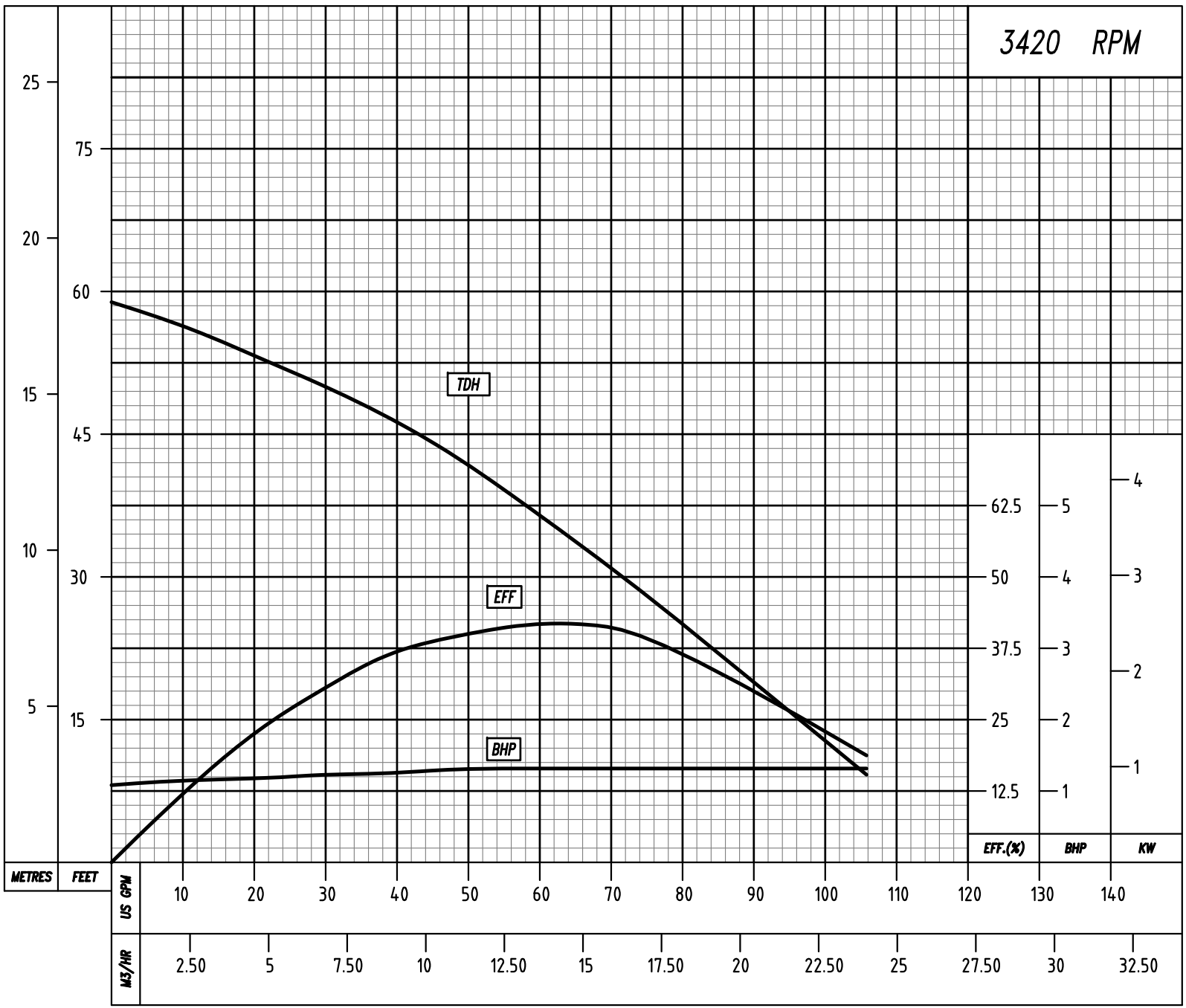
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SUCTION	INCHES	-
	MM	-
TEST NUMBER	-	

IMPELLER TYPE	SEMI-OPEN	
IMP. DIAMETER	INCHES	4.3
	MM	110
NUMBER OF VANES	3	
MAX.PARTICLE	INCHES	0.47
	MM	12



PERFORMANCE FOR WATER @ 68°F/20°C
 AND 1.0 S.G. CORRECT FOR OTHER
 CONDITIONS AND/OR SOLIDS EFFECT

3420 RPM



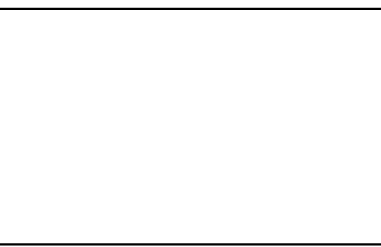
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 TEL : (604)298-1213 FAX : (604)298-7773

PUMP MODEL	HT-25		
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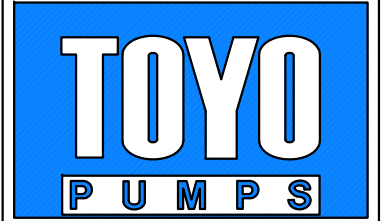
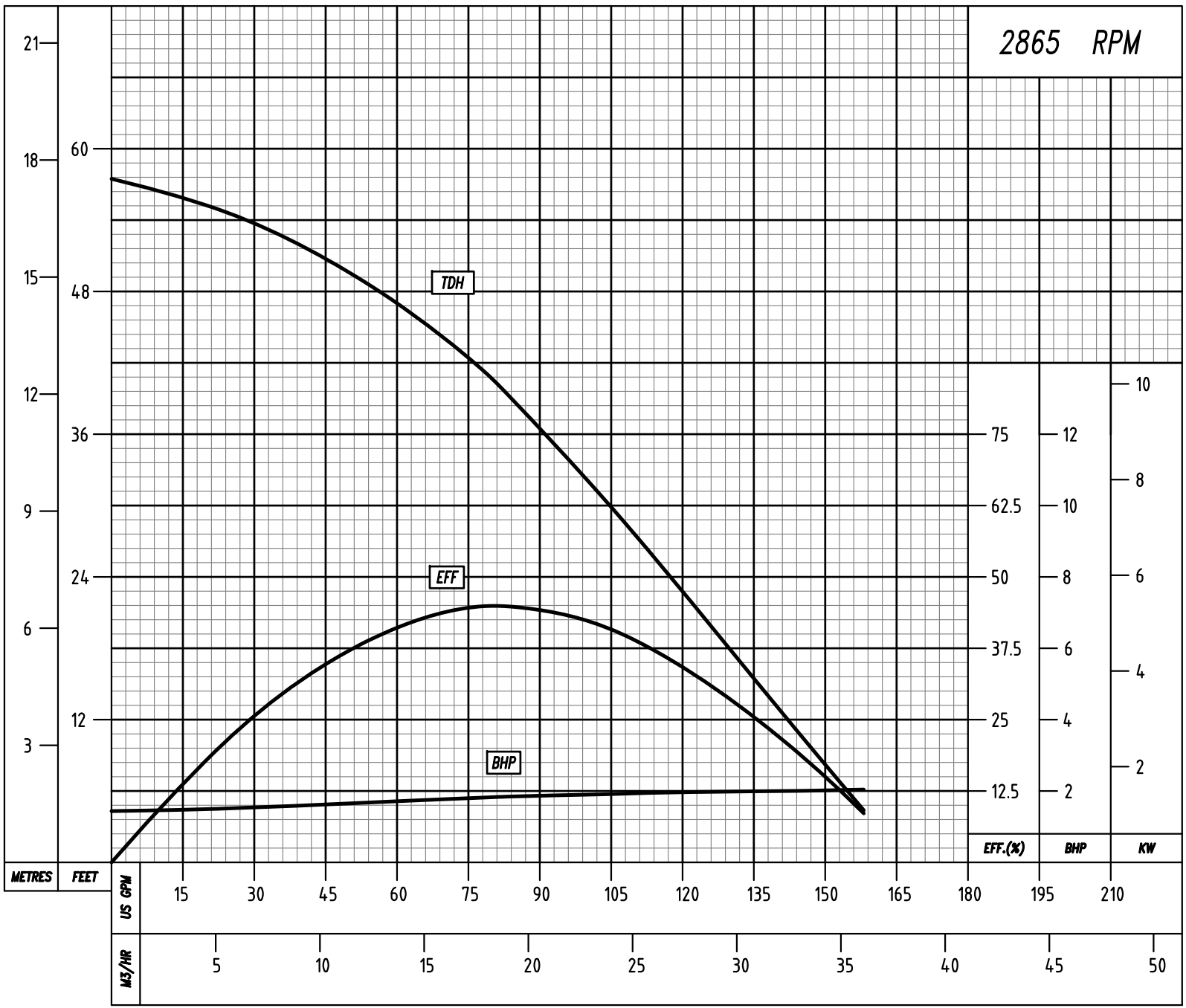
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SUCTION	INCHES	-
	MM	-
TEST NUMBER	-	

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IMP. DIAMETER	INCHES	4.3
	MM	110
NUMBER OF VANES	3	
MAX.PARTICLE	INCHES	0.47
	MM	12



PERFORMANCE FOR WATER @ 68°F/20°C
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 CONDITIONS AND/OR SOLIDS EFFECT

2865 RPM



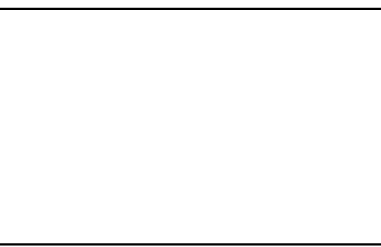
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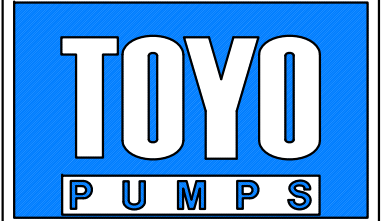
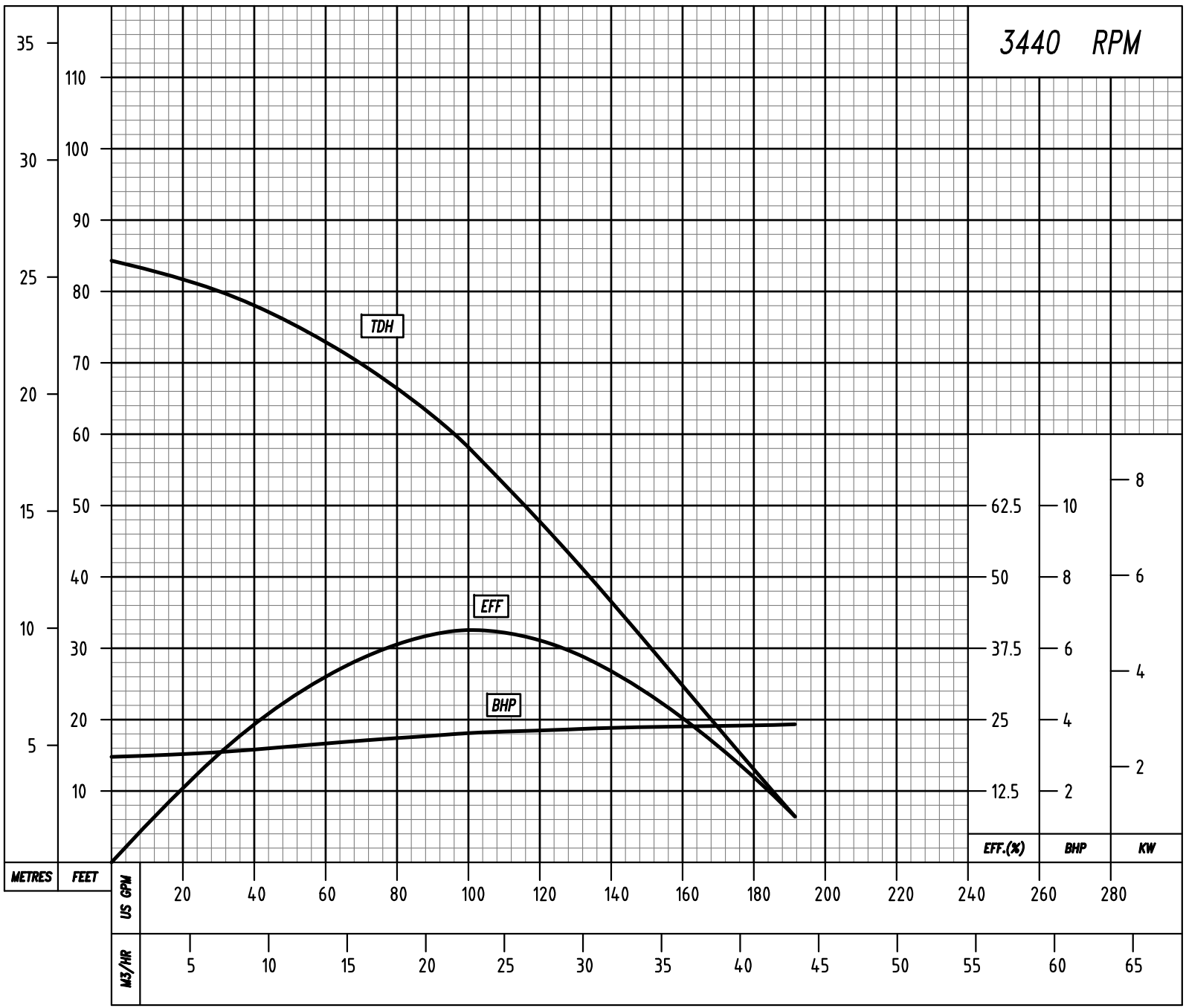
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	MM	80
SUCTION	INCHES	-
	MM	-
TEST NUMBER	-	

IMPELLER TYPE	SEMI-OPEN	
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	MM	130
NUMBER OF VANES	3	
MAX.PARTICLE	INCHES	0.59
	MM	15



PERFORMANCE FOR WATER @ 68°F/20°C
 AND 1.0 S.G. CORRECT FOR OTHER
 CONDITIONS AND/OR SOLIDS EFFECT

3440 RPM



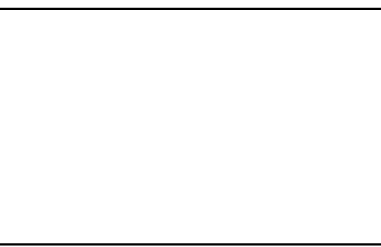
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PUMP MODEL	HT-50		
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EFFECTIVE DATE	12 NOV 2015		
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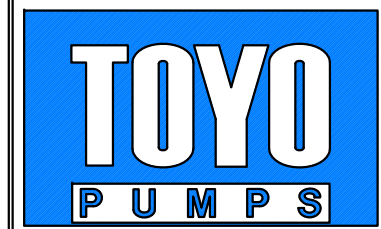
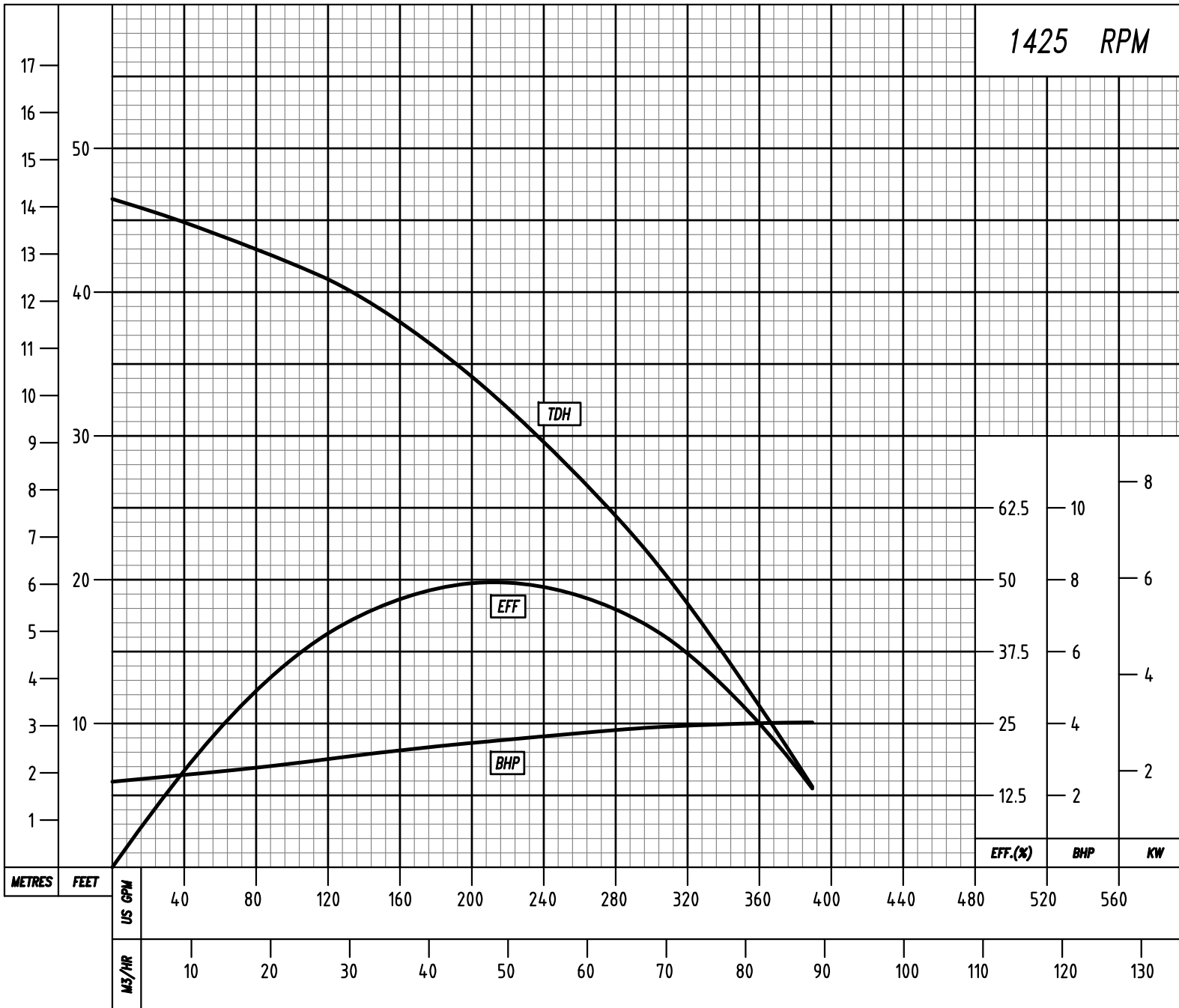
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SUCTION	INCHES	-
	MM	-
TEST NUMBER	-	

IMPELLER TYPE	SEMI-OPEN	
IMP. DIAMETER	INCHES	5.1
	MM	130
NUMBER OF VANES	3	
MAX.PARTICLE	INCHES	0.59
	MM	15



PERFORMANCE FOR WATER @ 68°F/20°C
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1425 RPM



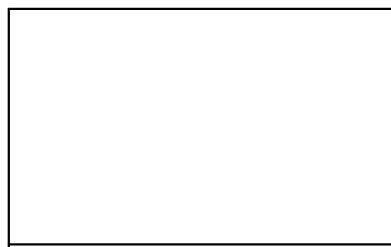
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PUMP MODEL	HT-100		
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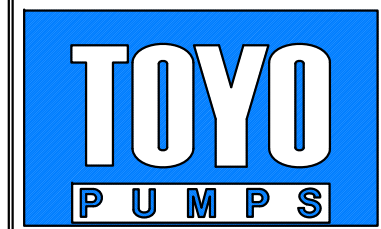
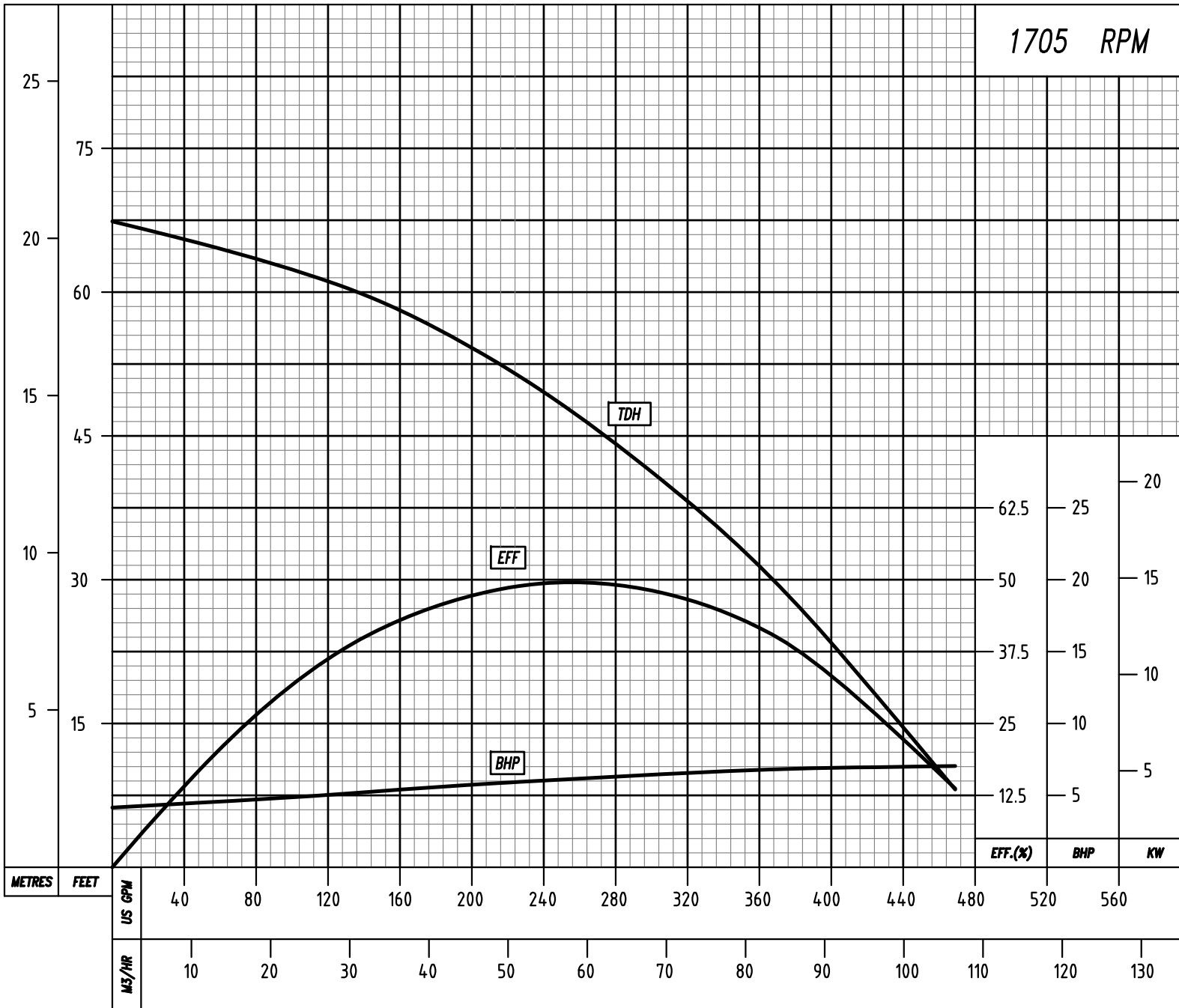
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	MM	-
TEST NUMBER	-	

IMPELLER TYPE	SEMI-OPEN	
IMP. DIAMETER	INCHES	8.1
	MM	205
NUMBER OF VANES	3	
MAX.PARTICLE	INCHES	1.18
	MM	30



PERFORMANCE FOR WATER @ 68°F/20°C
 AND 1.0 S.G. CORRECT FOR OTHER
 CONDITIONS AND/OR SOLIDS EFFECT

1705 RPM



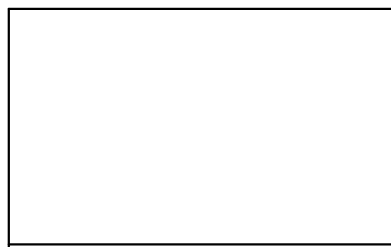
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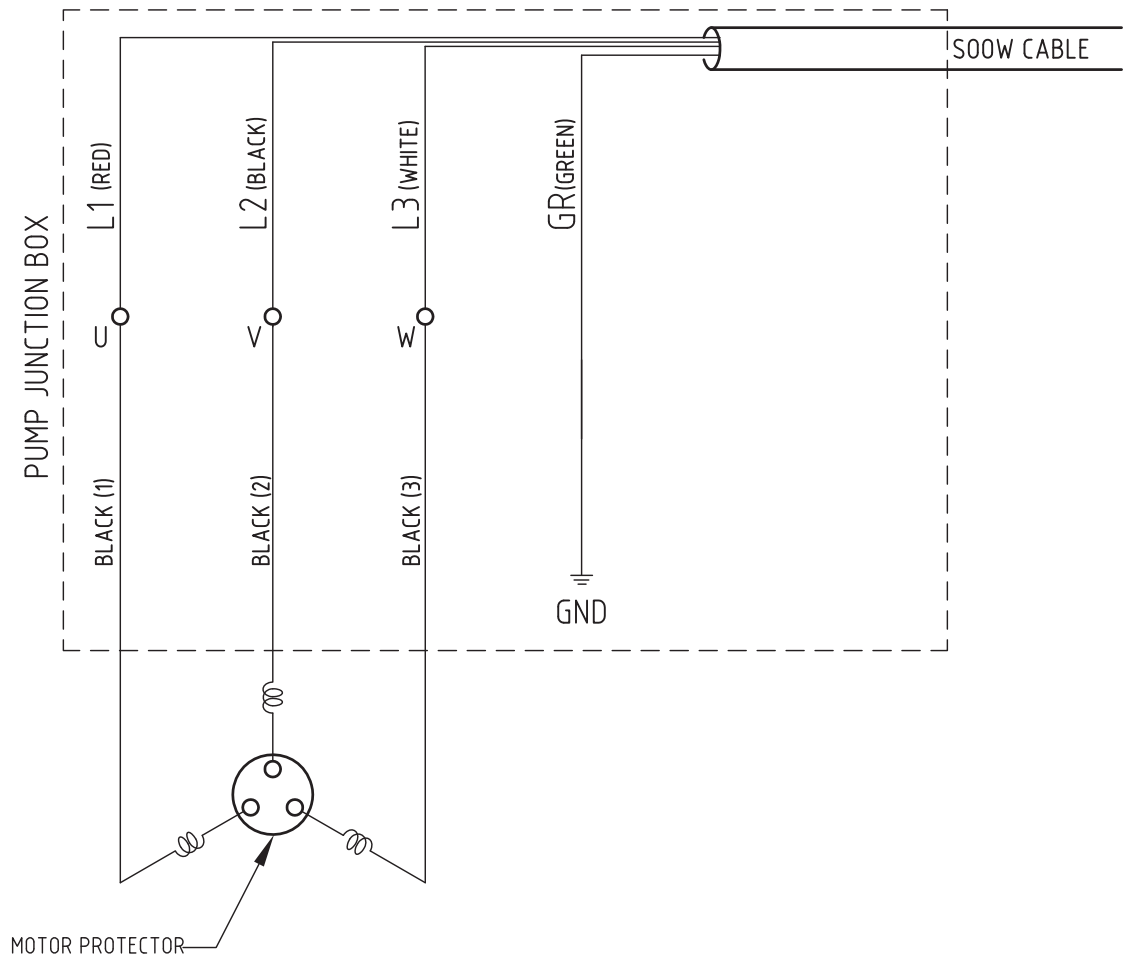
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SUCTION	INCHES	-
	MM	-
TEST NUMBER	-	

IMPELLER TYPE	SEMI-OPEN	
IMP. DIAMETER	INCHES	8.1
	MM	205
NUMBER OF VANES	3	
MAX.PARTICLE	INCHES	1.18
	MM	30



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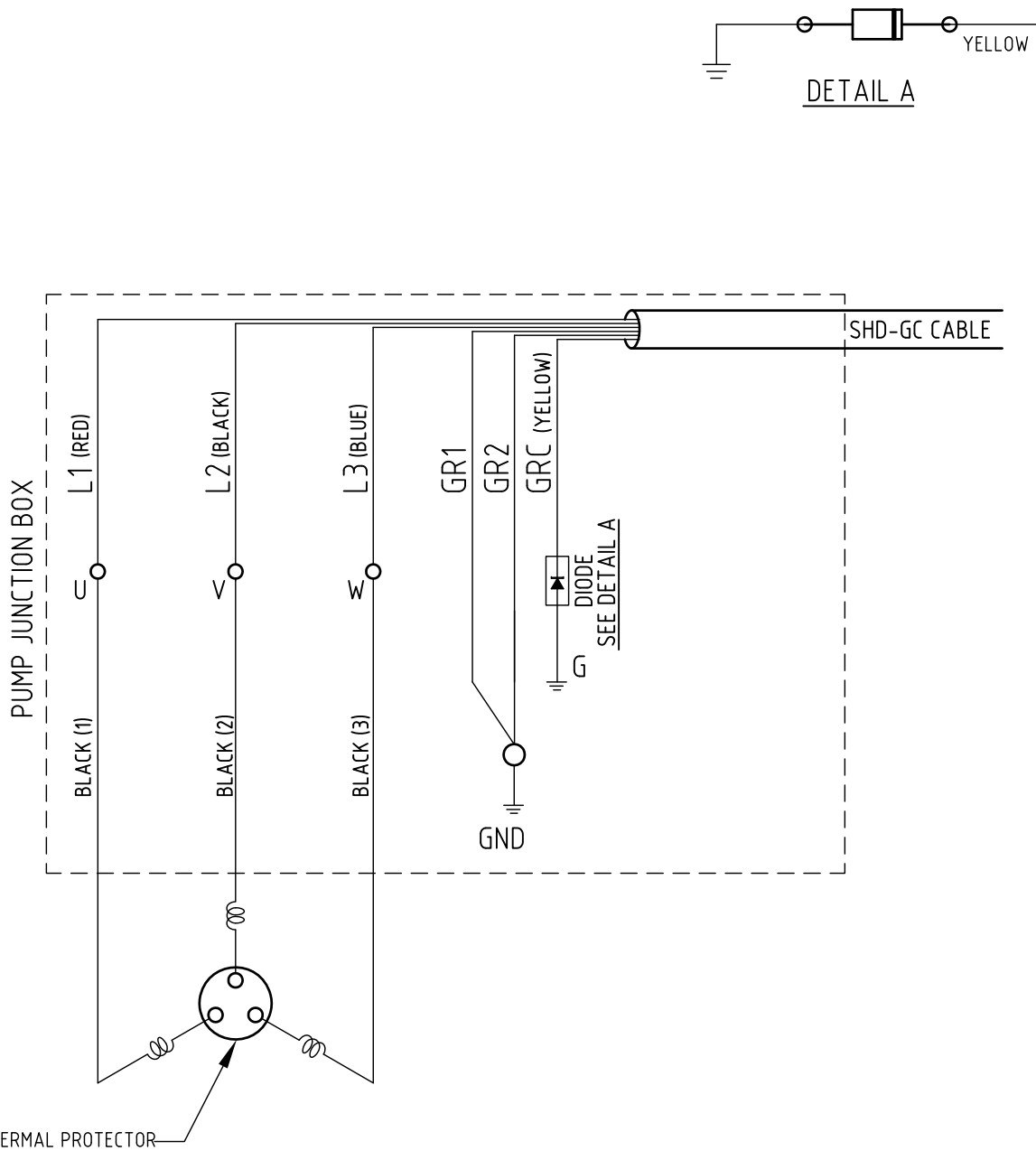
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TYPE / FRAME	3 - 7.5		
B.O.M.	-		
ORIG. JOB NO.	-		
ORIG. ORDER NO.	-		
SCALE	NTS		
DRAWN	A.P.	DATE	6 JUN 16
CHKD.		DATE	
APPVD.		DATE	
REPLACES	-		



Toyo Pumps
North America Corporation
British Columbia, Canada

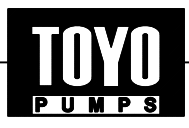
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REPLACED BY	-	

SHEET	1 OF 1
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PRODUCT LINE	HT		
TYPE / FRAME	3 - 7.5-MS		
B.O.M.	-		
ORIG. JOB NO.	-		
ORIG. ORDER NO.	-		
SCALE	NTS		
DRAWN	A.P.	DATE	11 MAY 17
CHKD.		DATE	
APPVD.	CDM	DATE	11 MAY 17
REPLACES	-		



Toyo Pumps
North America Corporation
British Columbia, Canada

TITLE		DRAWING NO.	REV.
WIRING DIAGRAM, 1 POWER DOL, SHD-GC		DN12613	0
REPLACED BY	-	SHEET	1 OF 1

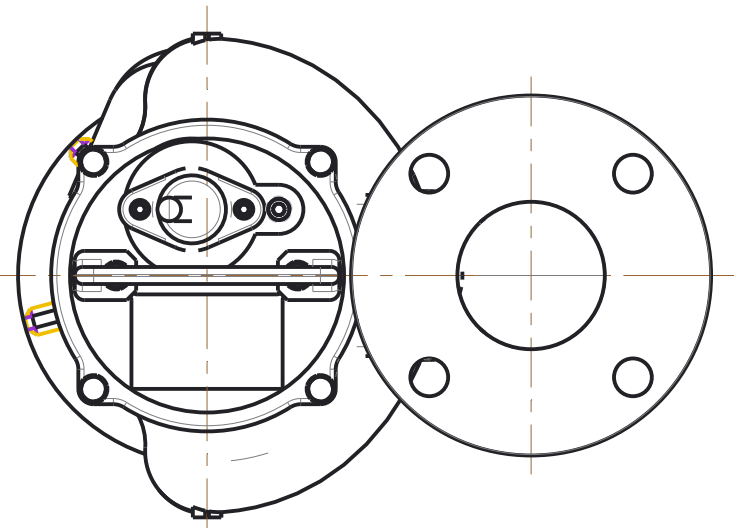
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 Drawing: ASSEM
 File: ASSEM
 Vision Modified On: 13-Jun-18 07:27:59 AM
 13-Jun-18 07:27:59 AM
 Release Level: Released
 Released
 Released
 Ra
 4
 3
 2
 1

366 (REF)

171.5

252 (REF)



PUMP DISCHARGE
 3" FLANGE 150# FF
 ASME / ANSI B16.5

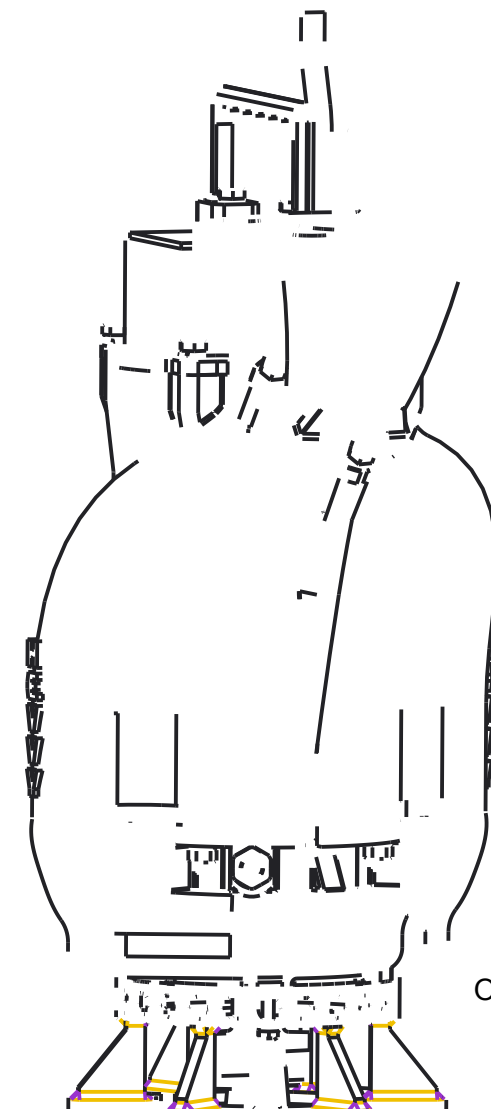
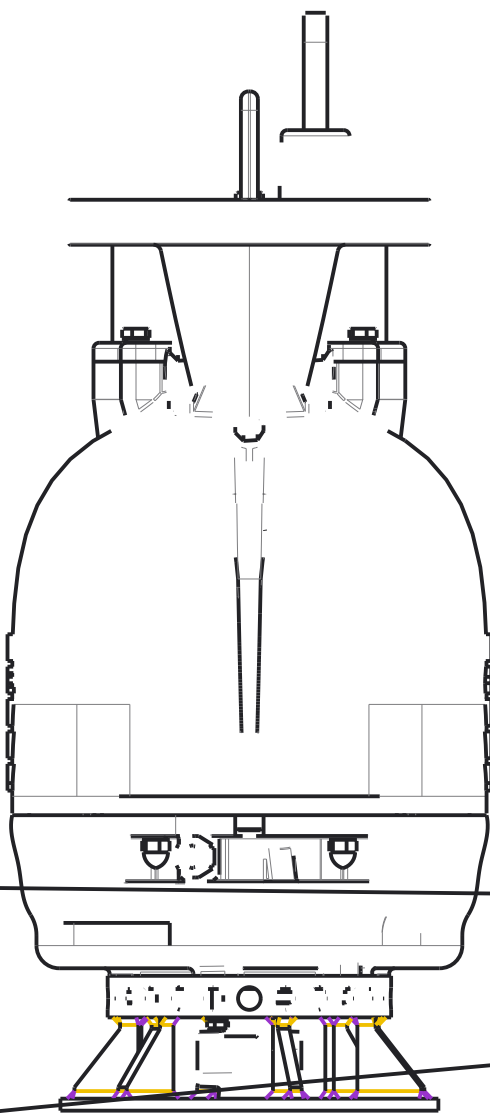
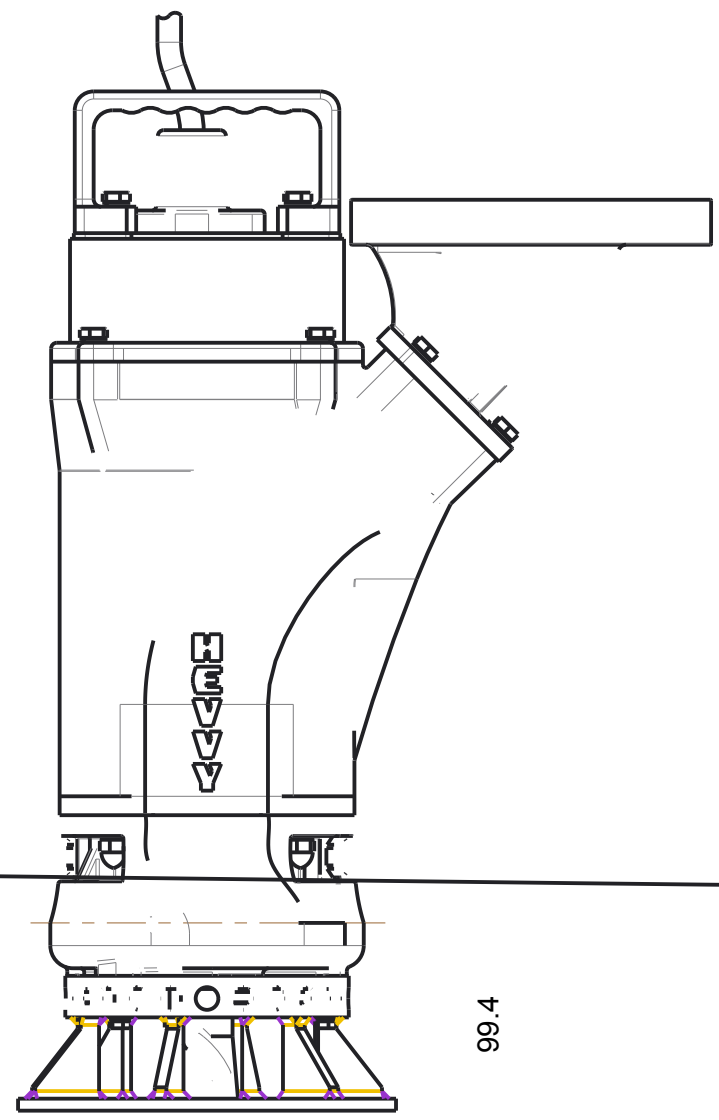
- NOTE:
1. CONTINUOUS RUNNING WATER LEVEL
 2. ISO VG 32 OIL USED IN THE SEAL BOX
 3. 275ml OIL QUANTITY

539.4 (REF)

482

99.4

156 C.W.L.



OIL SIGHT GLASS

PRODUCT LINE	HT	TITLE
TYPE / FRAME	HT-25	
SCALE	0.250	
DRAWN	CDM	DATE 20-JUN-14
CHKD.		DATE
APPVD.	NJG	DATE 20-JUN-14
REPLACES		
REPLACED BY		

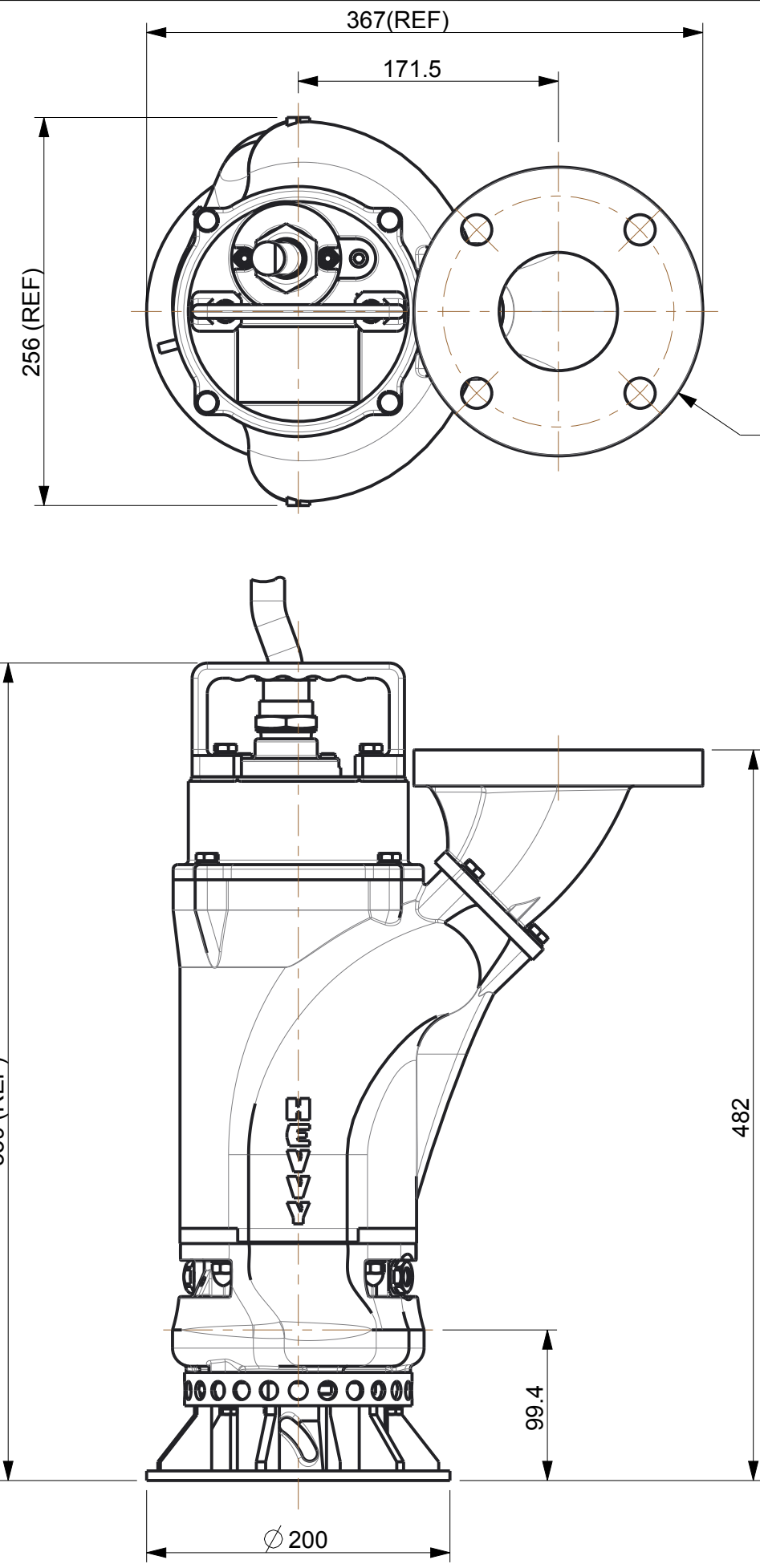
HEAVY PUMPS
 HT-25
 OUTLINE DRAWING

TOYO PUMPS
 DRAWING NO. HT-25
 REV. 6
 SHEET: 1 OF 2

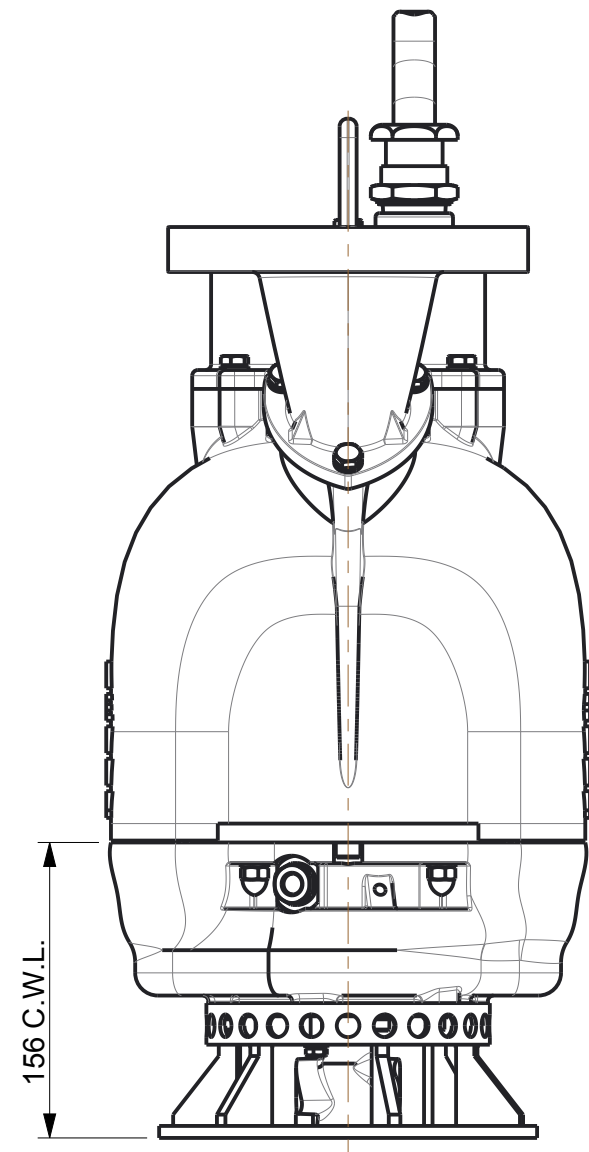
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File Name	HT-25-MS	Revision Modified On	13-Jun-18 09:17:59 AM	Release Level	Released
Drawing	ASSEM		13-Jun-18 09:10:25 AM		Released

Circle Drawing Format B
A
(mm) unless otherwise stated.

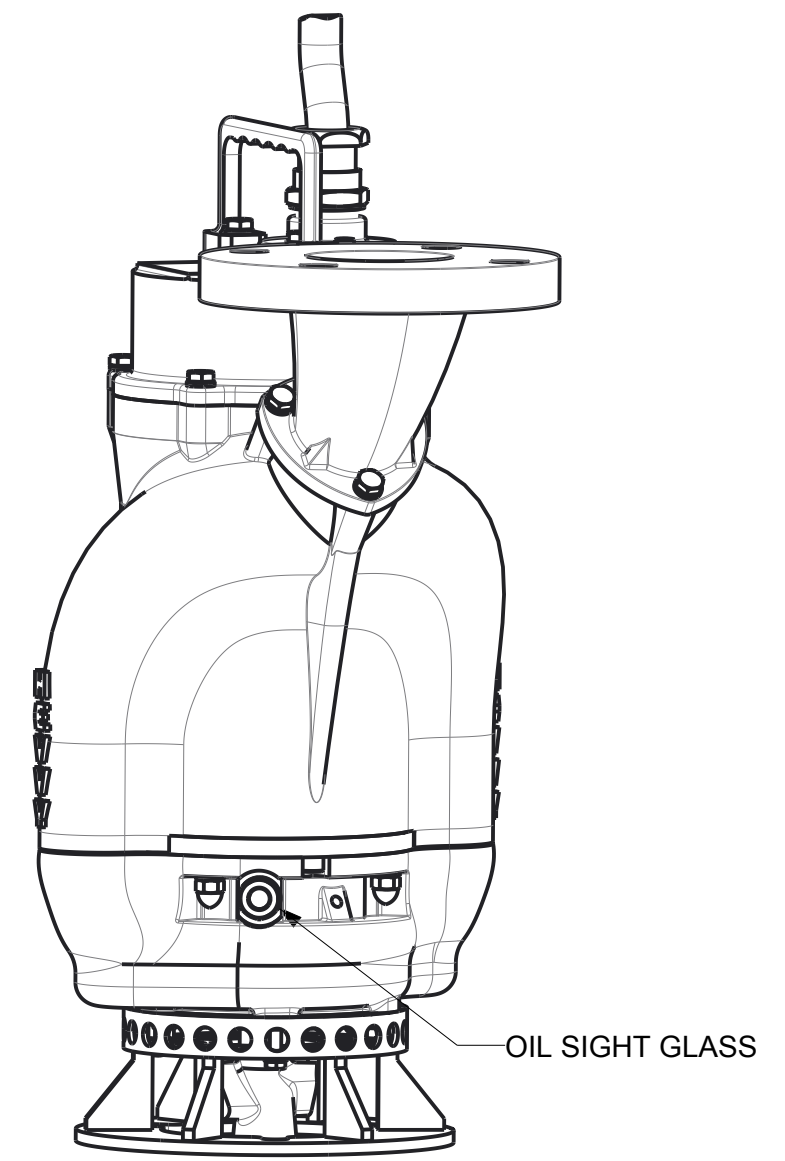


PUMP DISCHARGE
3" FLANGE 150# FF
ASME / ANSI B16.5



156 C.W.L.

- NOTE:
1. CONTINUOUS RUNNING WATER LEVEL
 2. ISO VG 32 OIL USED IN THE SEAL BOX
 3. 275ml OIL QUANTITY



OIL SIGHT GLASS

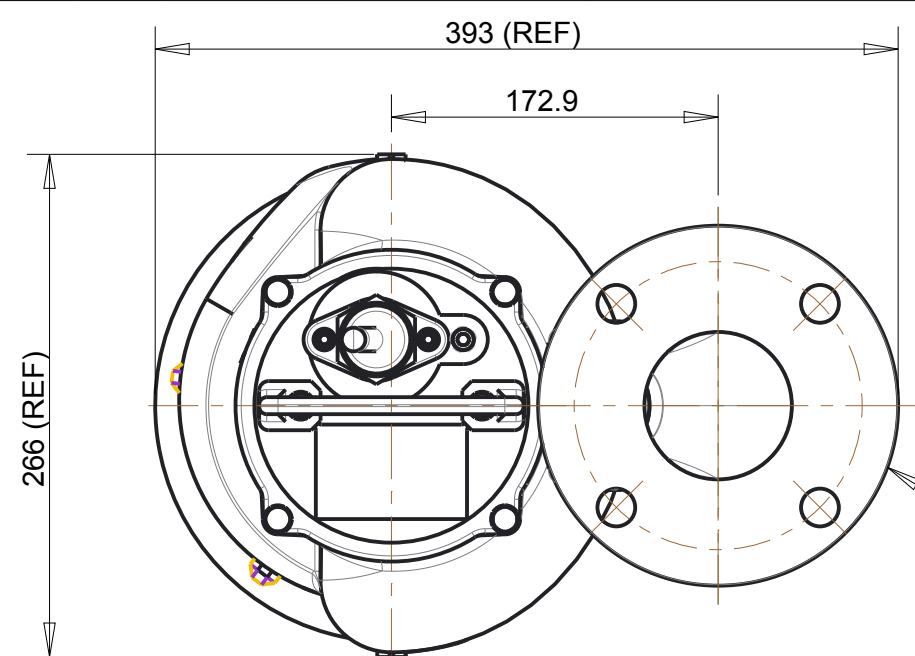
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CHKD.	
DATE	
APPVD.	NJG
DATE	01-MAY-17
REPLACES	-
REPLACED BY	-

TITLE		DRAWING NO.	REV.
HT-25-MS OUTLINE DRAWING		HT-25-MS	0
SHEET: 1 OF 2			

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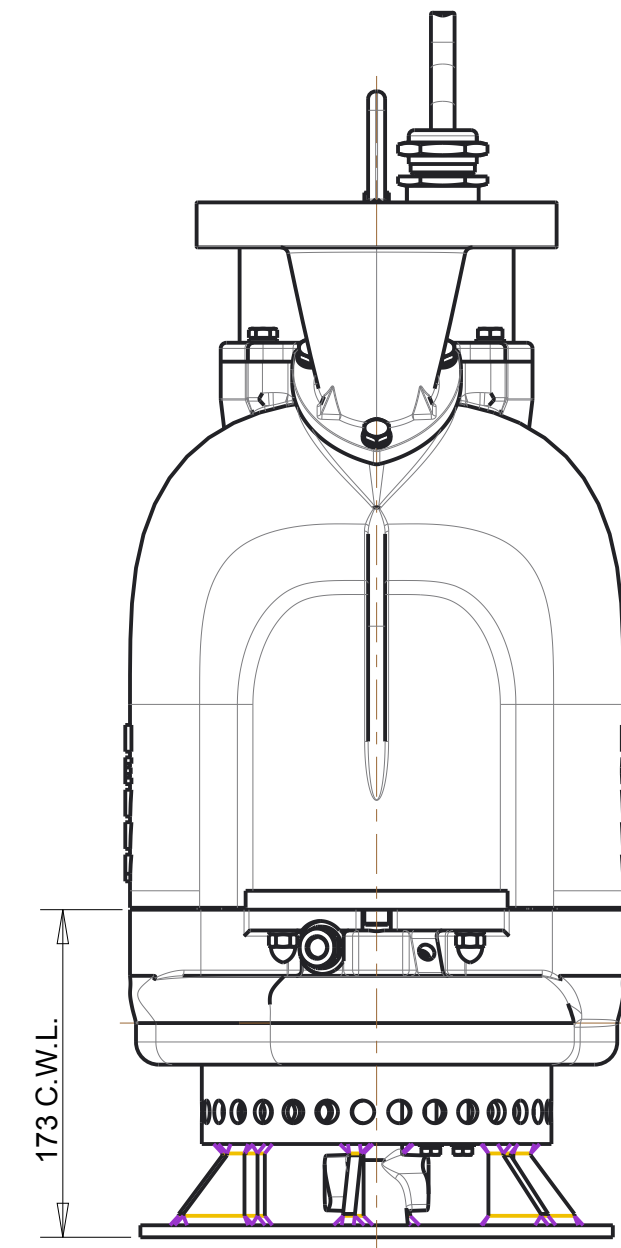
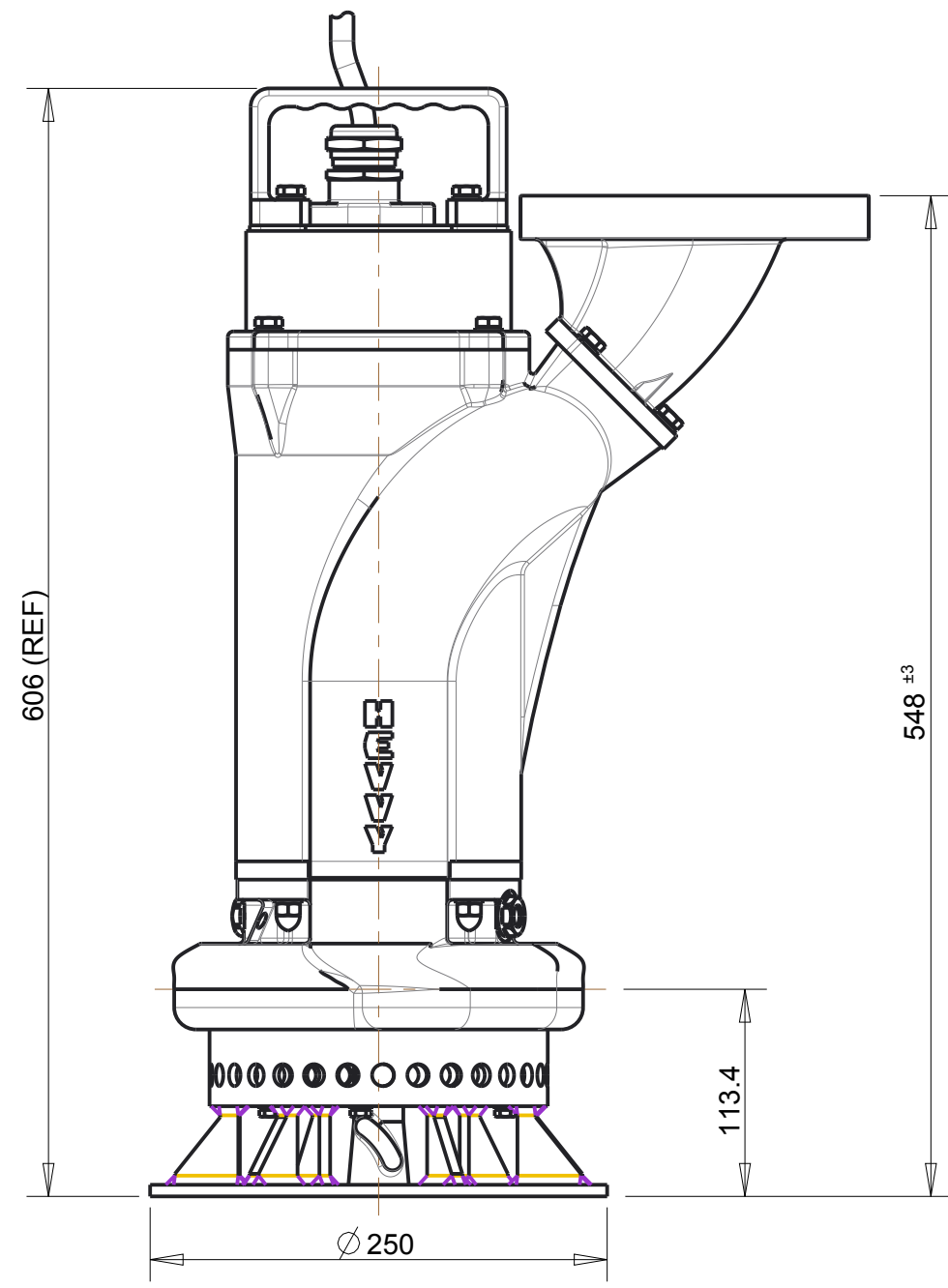
File Name	Revision Modified On	Release Level
HT-50	12-Jun-18 02:40:24 PM	Released
HT-50	12-Jun-18 02:40:24 PM	Released

Circle Drawing Format B
 A
 (mm) unless otherwise stated.

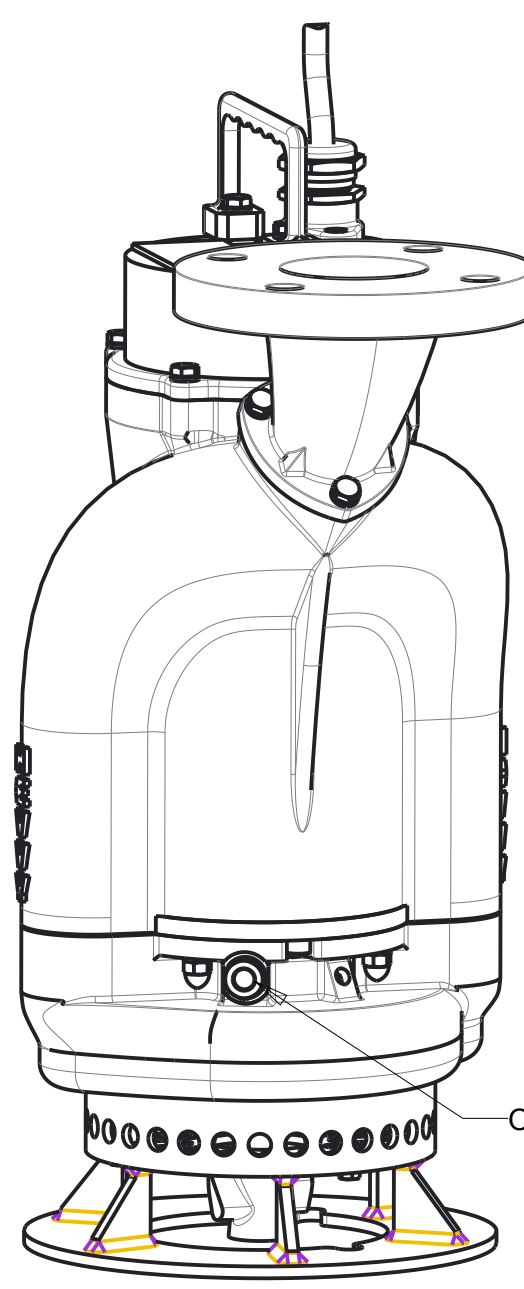


- NOTES:
 1. CONTINUOUS RUNNING WATER LEVEL (C.W.L.)
 2. ISO VG 32 OIL USED IN THE SEAL BOX
 3. 350ml OIL QUANTITY

PUMP DISCHARGE
 3" FLANGE 150# FF
 ASME / ANSI B16.5



REV	ECN	ZONE	CHANGE DESCRIPTION	BY	APPROVED	DATE
2	-	-	REVISED P/N 23965 MATERIAL AND 23999 DWG NO.	A.P.	-	15 DEC 15
3	-	-	REVISED TITLE, DRAWING NO. & TYPE/FRAME FROM HNS-5 TO HT-5, CHANGED ITEMS 27 & 37 FROM M6 TO M4, AND ADDED CRITICAL/RECOMMENDED SPARES DESIGNATIONS	KL	CDM	6 JAN 16
4	-	-	REVISED MODEL NUMBER, WAS HT-5.ADDED CABLE ASSEMBLY P/N:	CDM	NJG	12 JUN 18



OIL SIGHT GLASS

SCALE 0.250

PRODUCT LINE	HT
TYPE / FRAME	HT-50
SCALE	0.250
DRAWN	CDM
DATE	22-APR-14
CHKD.	
DATE	
APPVD.	NJG
DATE	22-APR-14
REPLACES	
REPLACED BY	

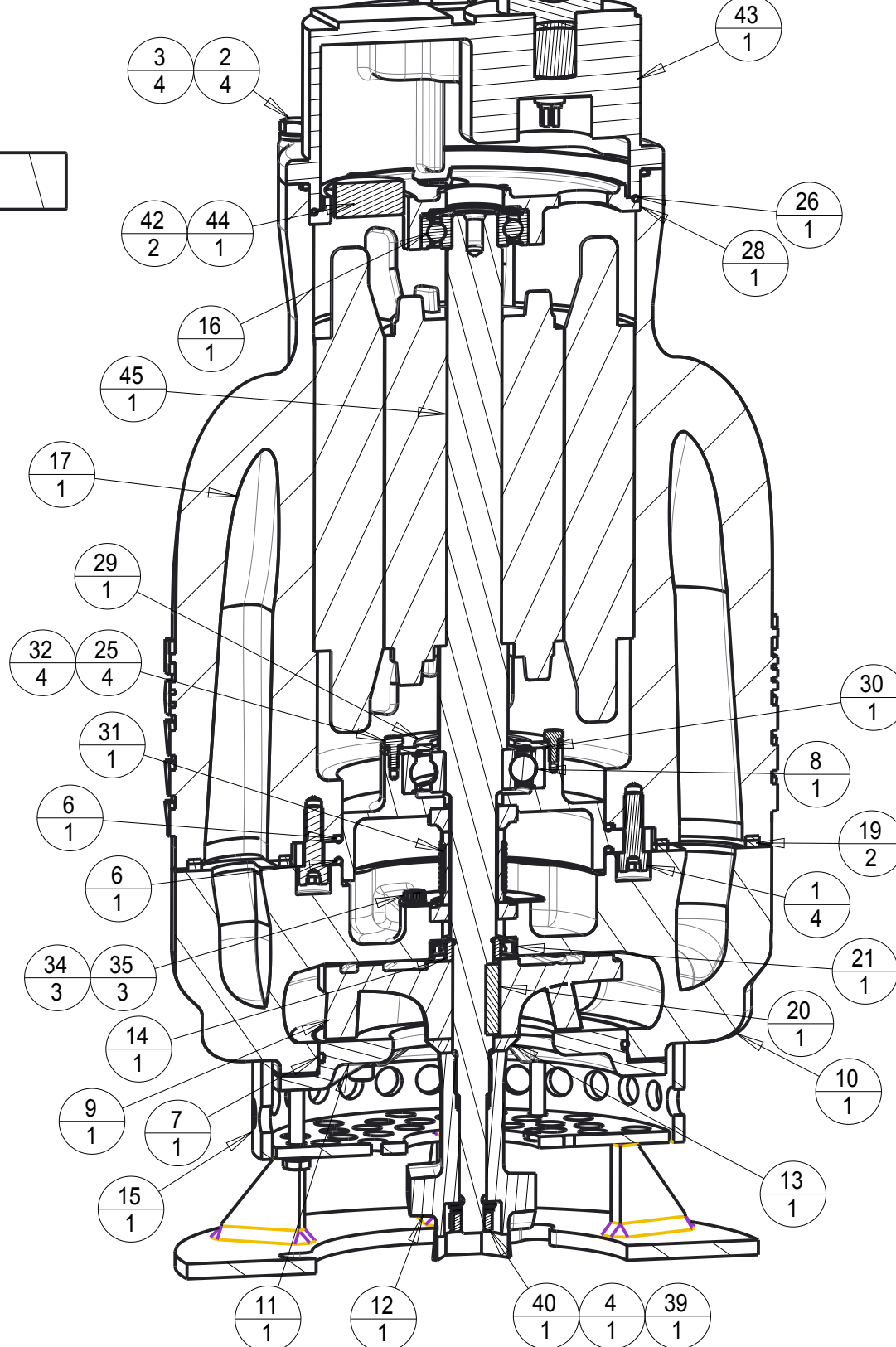
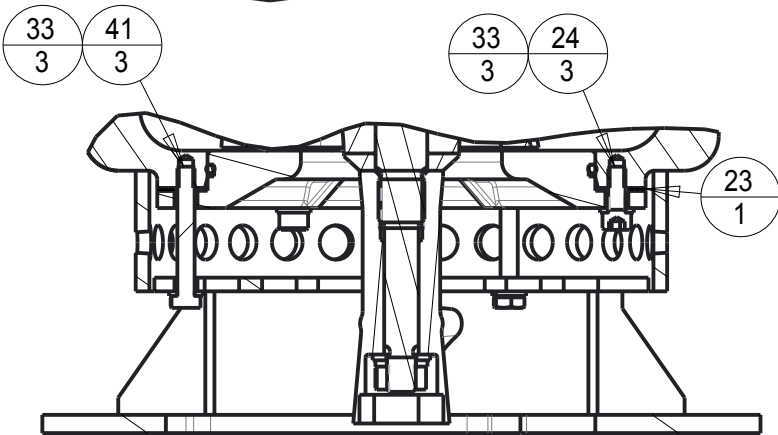
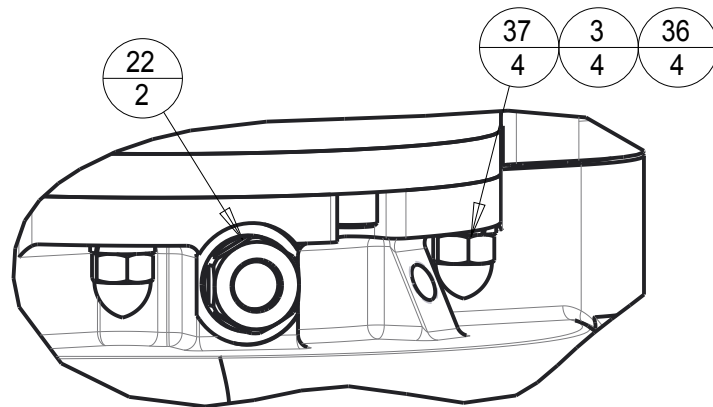
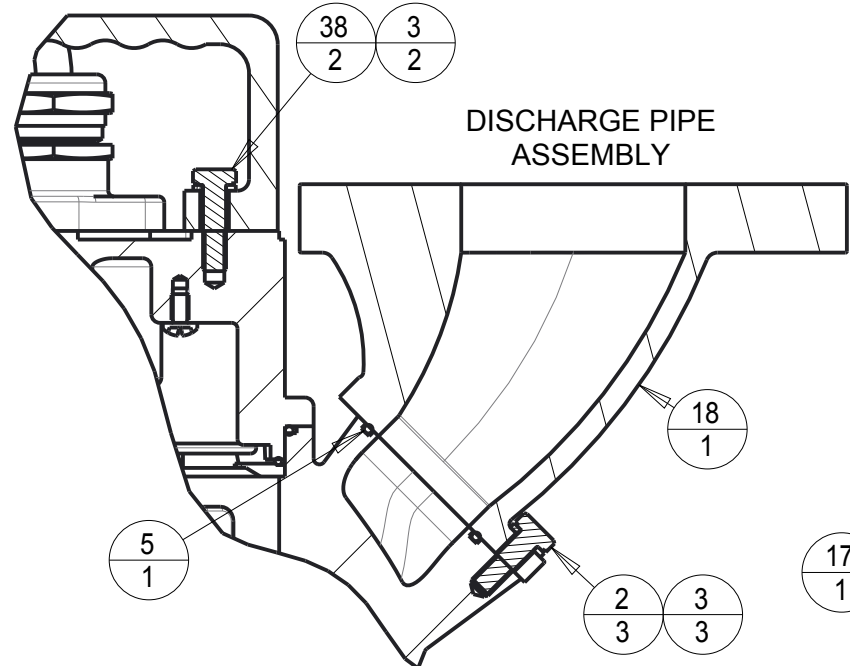
TITLE		DRAWING NO.	REV.
HT-50 OUTLINE DRAWING		HT-50	4
SHEET: 1 OF 2			

TABLE A

PUMP P/N	DESCRIPTION	ITEM 51 MT PROTECTOR	ITEM 52 STATOR / ROTOR	ITEM 11 SUCTION COVER	ITEM 10 PUMP CASING
24659	HT-50-380-50	26418	26365	N/A	N/A
29615	HT-50-380-50-HC			28655	28654
24653	HT-50-460-60	26414	26366	N/A	N/A
29616	HT-50-460-60-HC			28655	28654
24656	HT-50-575-60	26417	26367	N/A	N/A
29617	HT-50-575-60-HC			28655	28654

ESTIMATED WEIGHT: 70 kg

- NOTES:
 1. * = RECOMMENDED SPARE (3-5 YEARS)
 2. ** = CRITICAL SPARE (0-2 YEARS)



QTY	POS.	PART NO.	DESCRIPTION	MATERIAL	DRAWING	KG
1	52	SEE TABLE 'A'	STATOR, ROTOR, SHAFT UNIT, HT-50			17.4
1	51	SEE TABLE 'A'	THERMAL PROTECTION, MOTOR			0.1
1	43	30306	ASSEMBLY, CABLE HT-25, 50 SOOW			4.6
2	42	26496	SCREW, CROSS RECESSED PAN HEAD	412000_STEEL_GRADE_A2_CLASS_70		0.0
3	41	26494	SCREW, HEX HEAD, PT, CAP	412000_STEEL_GRADE_A2_CLASS_70		12.9
1	40	26492	NUT, HEXAGON	412000_STEEL_GRADE_A2_CLASS_70		0.0
1	39	26491	WASHER, FLAT	416000_STEEL_GRADE_A2		0.0
2	38	26490	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70		0.0
4	37	26489	NUT, DOME	412000_STEEL_GRADE_A2_CLASS_70		0.0
4	36	26488	STUD	412000_STEEL_GRADE_A2_CLASS_70		0.0
3	35	26481	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70		4.0
3	34	26480	WASHER, LOCK	416000_STEEL_GRADE_A2		0.0
6	33	26470	WASHER, LOCK	416000_STEEL_GRADE_A2		0.0
4	32	26387	WASHER, LOCK	416000_STEEL_GRADE_A2		0.0
**	1	26360	ASSEMBLY, MECHANICAL SEAL		EW-00904-01-00	0.2
1	30	26348	HOUSING, MECHANICAL SEAL, HT-25,50	003000_ASTM_A536_GR_60-40-18	012TK1151155	1.6
1	29	26346	COVER, BEARING	074000_JIS_G_3101_SS34	021050000765	0.1
1	28	26345	HOUSING, RADIAL BEARING, HT-25,50	001000_ASTM_A48_CL_30B	003T11450005	0.7
1	27	26344	HANDLE, HT-25, 50	003000_ASTM_A536_GR_60-40-18	031TK0000955	0.3
**	1	26241	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		0.0
4	25	25213	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70		2.2
3	24	25211	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70		0.0
*	1	25082_KIT	KIT, SHIM, HT-50		DN11058	0.0
2	22	24564	OIL SIGHT GLASS, HT	081000_ASTM_316SS		0.0
**	1	24403	SEAL, LIP, BUNA	161000_NITRILE_70_DURO_LIP_SEAL		0.0
**	1	24402	KEY, STL	052010_ASTM_A108_GR_1045		0.0
**	2	24287	GASKET, CASING, HT-50		DN10759	0.0
*	1	24283	ELBOW, DISCHARGE	003000_ASTM_A536_GR_60-40-18	DN10755	5.4
1	17	24279	HOUSING, STATOR	003000_ASTM_A536_GR_60-40-18	DN10751	22.4
**	1	24243	BEARING, DEEP GROOVE BALL			0.1
1	15	24000	STRAINER, HT-50	057000_ASTM_A36	DN10643	3.3
**	1	23999	SLEEVE, DISTANCE	080010_ASTM_A276_TYPE_304	DN10642	0.0
**	1	23965	SLEEVE, DISTANCE	080010_ASTM_A276_TYPE_304	DN10639	0.0
*	1	23963	AGITATOR, HT	011000_ASTM_A532_CL_III_TYPE_A	DN10638	0.3
*	1	23960	COVER, SUCTION	003000_ASTM_A536_GR_60-40-18	DN10635	1.1
*	1	23958	CASING, PUMP	003000_ASTM_A536_GR_60-40-18	DN10633	10.3
*	1	23614	IMPELLER	011000_ASTM_A532_CL_III_TYPE_A	DN10558	1.7
**	1	19240	BEARING, DEEP BALL GROOVE			0.2
**	1	02514	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		0.0
**	2	02510	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		0.0
**	1	02427	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		0.0
1	4	02029	WASHER, LOCK	416000_STEEL_GRADE_A2		0.0
13	3	02028	WASHER, LOCK	416000_STEEL_GRADE_A2		0.0
7	2	01717	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70		0.0
4	1	01465	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70		0.0

PRODUCT LINE	HT
TYPE / FRAME	HT-50
SCALE	0.380
DRAWN	CDM
DATE	22-APR-14
CHKD.	
DATE	
APPVD.	NJG
DATE	22-APR-14
REPLACES	
REPLACED BY	



TITLE	HT-50 SECTIONAL DRAWING	DRAWING NO.	HT-50	REV.	4
		SHEET: 2 OF 2			

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File Name	HT-50
Version Modified On	12-Jun-18 02:40:24 PM
Released	12-Jun-18 02:40:24 PM
Released	
File	ASSEM

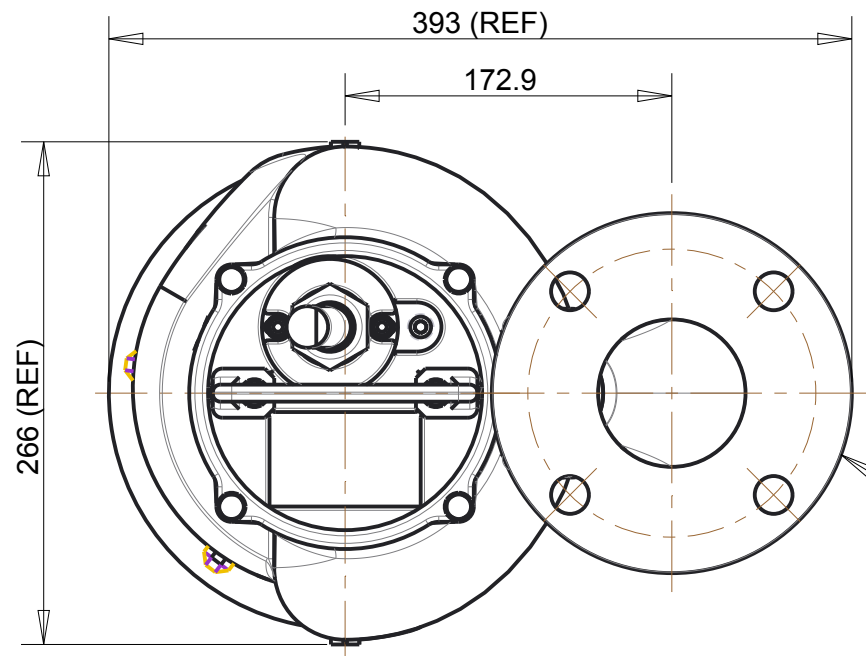
Auto Drawing Format B
 A: mm
 (mm) unless otherwise stated.

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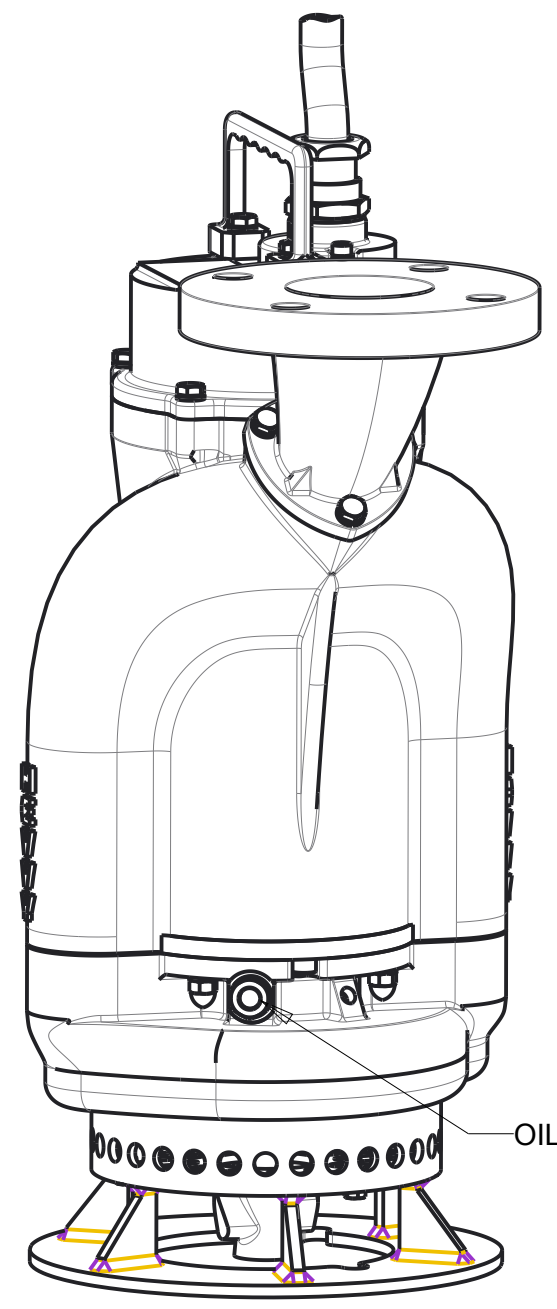
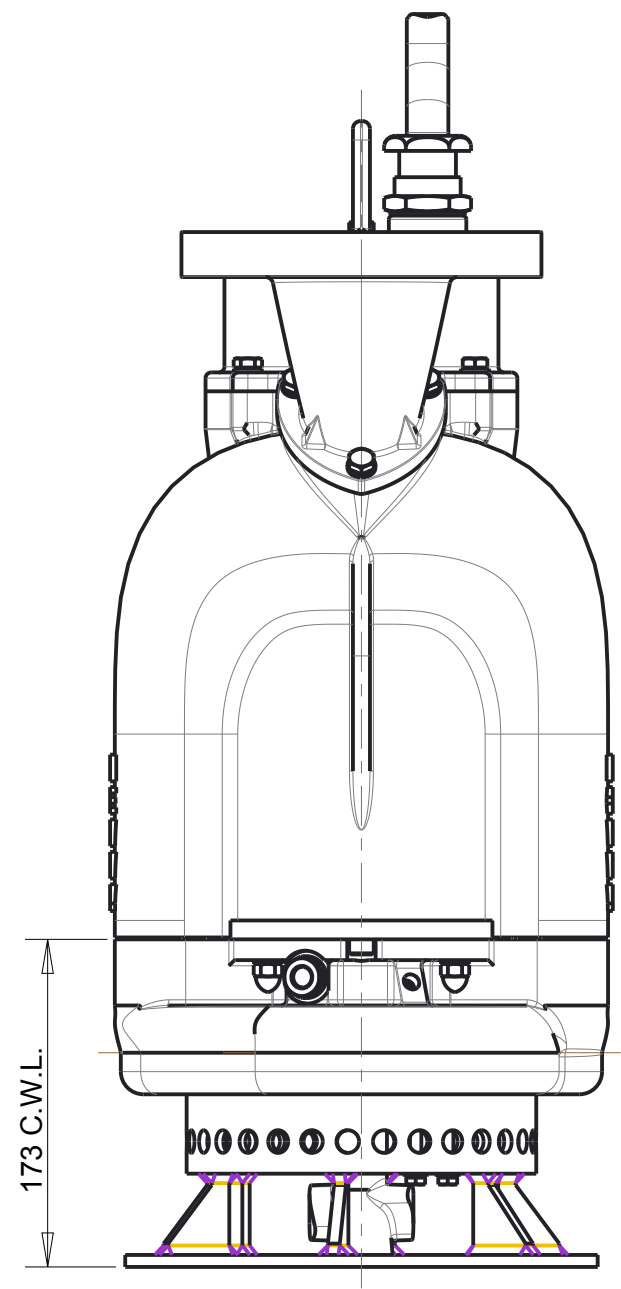
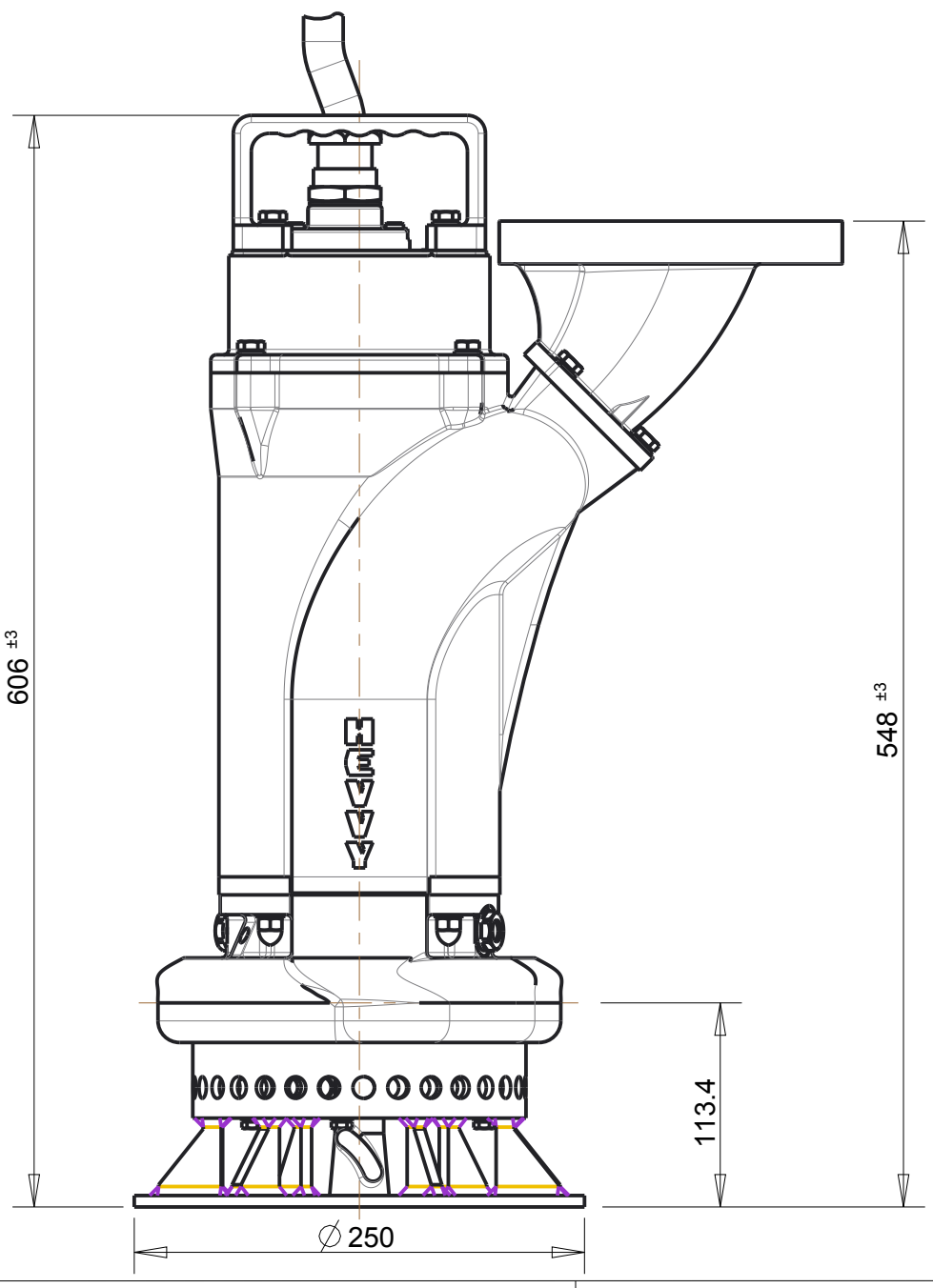
File Name	Revision Modified On	Release Level
HT-50-MS	12-Jun-18 02:38:26 PM	Released
HT-50-MS	12-Jun-18 02:39:25 PM	Released

Circle Drawing Format B
 A
 (mm) unless otherwise stated.

REV	ECN	ZONE	CHANGE DESCRIPTION	BY	APPROVED	DATE
1	-	-	MODEL NAME WAS HT-5. ADDED 460V P/N AND CABLE ASSEMBLY P/N.	CDM	-	11-JUN-18
-	-	-	-	-	-	-



PUMP DISCHARGE
 3" FLANGE 150# FF
 ASME / ANSI B16.5



SCALE 0.250

PRODUCT LINE	HT
TYPE / FRAME	HT-50-MS
SCALE	0.250
DRAWN	CDM
DATE	10-MAY-17
CHKD.	
DATE	
APPVD.	NJG
DATE	10-MAY-17
REPLACES	
REPLACED BY	

		TITLE	DRAWING NO.	REV.
		HT-50-MS OUTLINE DRAWING	HT-50-MS	1
		SHEET: 1 OF 2		

4

3

2

1

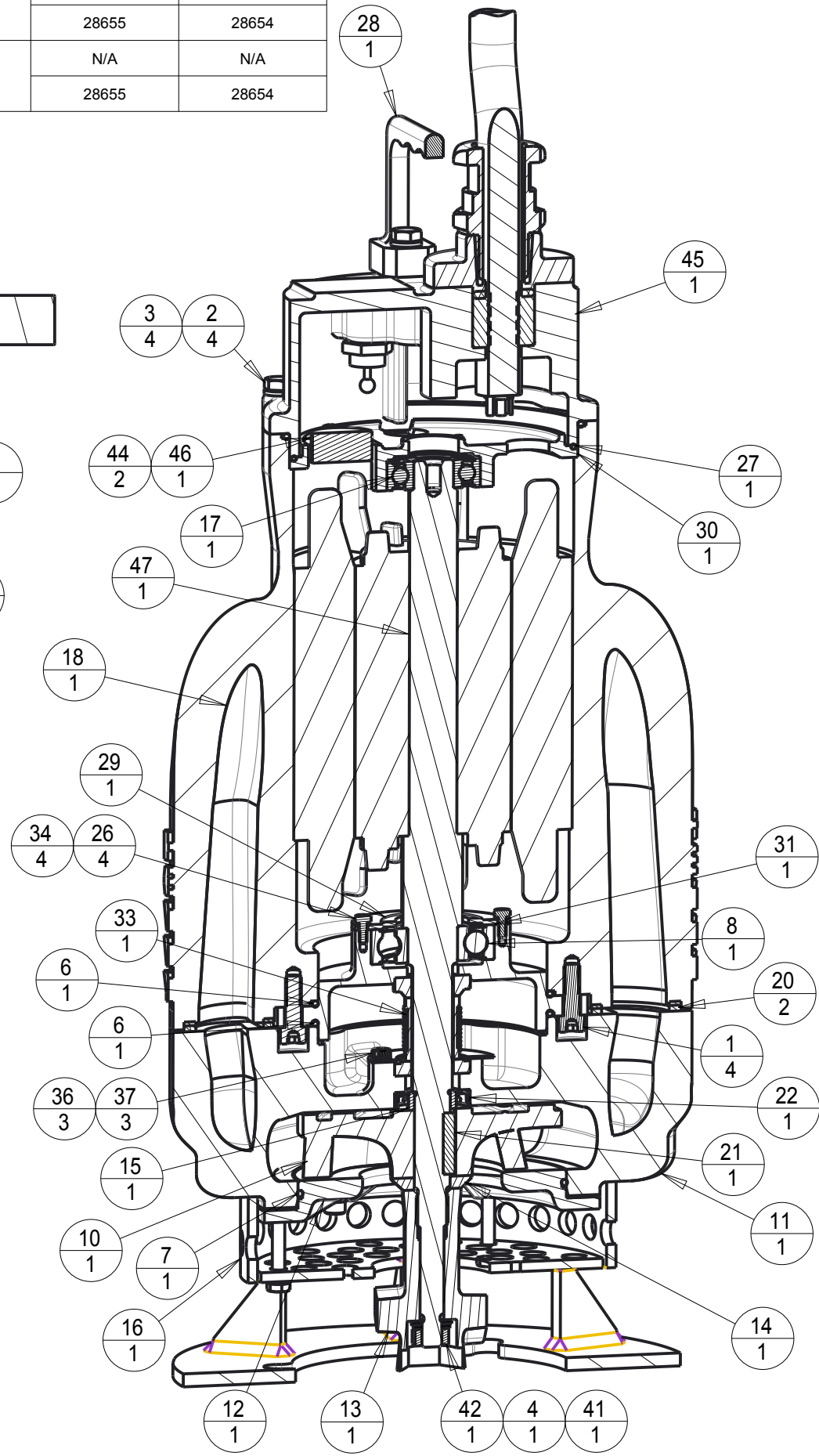
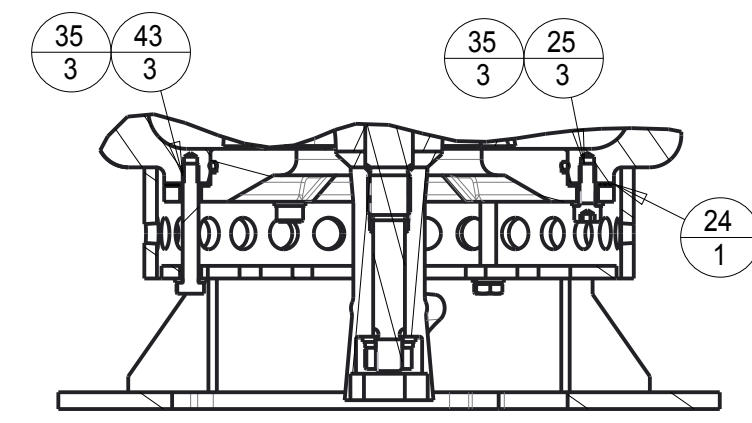
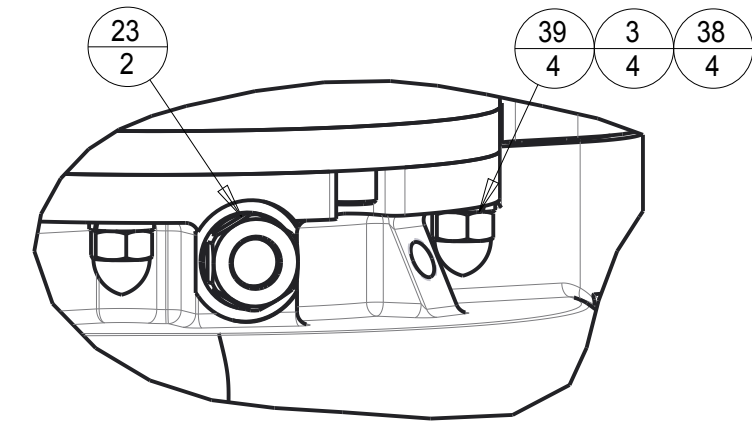
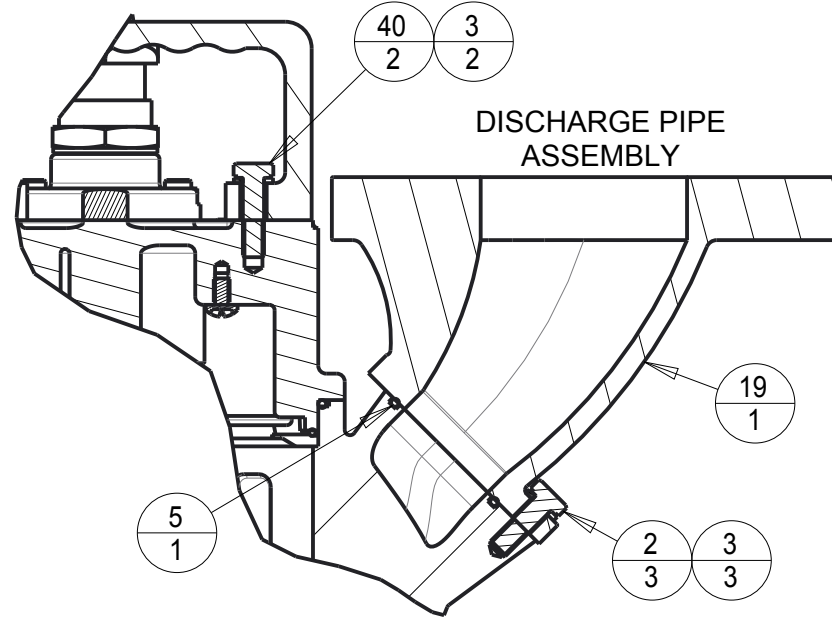
TABLE 'A'

PUMP P/N	DESCRIPTION	ITEM 51 MT PROTECTOR	ITEM 52 STATOR /ROTOR	ITEM 11 SUCTION COVER	ITEM 10 PUMP CASING
29087	HT-50-575-60-MS	26417	26367	N/A	N/A
29146	HT-50-575V-60-MS-HC			28655	28654
30942	HT-50-460-60-MS	26414	26366	N/A	N/A
30943	HT-50-460-60-MS-HC			28655	28654

ESTIMATED PUMP WEIGHT = 70 KG

- NOTES:
 1. * = RECOMMENDED SPARE (3-5 YEARS)
 2. ** = CRITICAL SPARE (0-2) YEARS)

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ITEM NO	PART No.	QTY	DESCRIPTION	MATERIAL	DRAWING NO.		
52	SEE TABLE 'A'	1	STATOR, ROTOR, SHAFT UNIT, HT-50				
51	SEE TABLE 'A'	1	THERMAL PROTECTION, MOTOR				
43	30305	1	ASSEMBLY, CABLE, HT-25,50, SHD-GC				
42	26496	2	SCREW, CROSS RECESSED PAN HEAD	412000_STEEL_GRADE_A2_CLASS_70			
41	26494	3	SCREW, HEX HEAD, PT, CAP	412000_STEEL_GRADE_A2_CLASS_70			
40	26492	1	NUT, HEXAGON	412000_STEEL_GRADE_A2_CLASS_70			
39	26491	1	WASHER, FLAT	416000_STEEL_GRADE_A2			
38	26490	2	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70			
37	26489	4	NUT, DOME	412000_STEEL_GRADE_A2_CLASS_70			
36	26488	4	STUD	412000_STEEL_GRADE_A2_CLASS_70			
35	26481	3	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70			
34	26480	3	WASHER, LOCK	416000_STEEL_GRADE_A2			
33	26470	6	WASHER, LOCK	416000_STEEL_GRADE_A2			
32	26387	4	WASHER, LOCK	416000_STEEL_GRADE_A2			
**	31	26360	1	ASSEMBLY, MECHANICAL SEAL	EW-00904-01-00		
30	29103	1	HOUSING, RADIAL BEARING, HT-25, 50	001000_ASTM_A48_CL_30B	DN12593		
29	26348	1	HOUSING, MECHANICAL SEAL, HT-25,50	003000_ASTM_A536_GR_60-40-18	012TK1151155		
28	26346	1	COVER, BEARING	074000_JIS_G_3101_SS34	021050000765		
27	26344	1	HANDLE, HT-25, 50	003000_ASTM_A536_GR_60-40-18	031TK0000955		
**	26	26241	1	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		
25	25213	4	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70			
24	25211	3	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70			
*	23	25082_KIT	1	KIT, SHIM, HT-50	DN11058		
22	24564	2	OIL SIGHT GLASS, HT	081000_ASTM_316SS			
**	21	24403	1	SEAL, LIP, BUNA	161000_NITRILE_70_DURO_LIP_SEAL		
**	20	24402	1	KEY, STL	052010_ASTM_A108_GR_1045		
**	19	24287	2	GASKET, CASING, HT-50		DN10759	
*	18	24283	1	ELBOW, DISCHARGE	003000_ASTM_A536_GR_60-40-18	DN10755	
17	24279	1	HOUSING, STATOR	003000_ASTM_A536_GR_60-40-18	DN10751		
**	16	24243	1	BEARING, DEEP GROOVE BALL			
15	24000	1	STRAINER, HT-50	057000_ASTM_A36	DN10643		
**	14	23999	1	SLEEVE, DISTANCE	080010_ASTM_A276_TYPE_304	DN10642	
**	13	23965	1	SLEEVE, DISTANCE	080010_ASTM_A276_TYPE_304	DN10639	
*	12	23963	1	AGITATOR, HT	011000_ASTM_A532_CL_III_TYPE_A	DN10638	
*	11	23960	1	COVER, SUCTION	003000_ASTM_A536_GR_60-40-18	DN10635	
*	10	23958	1	CASING, PUMP	003000_ASTM_A536_GR_60-40-18	DN10633	
*	9	23614	1	IMPELLER	011000_ASTM_A532_CL_III_TYPE_A	DN10558	
**	8	19240	1	BEARING, DEEP BALL GROOVE			
**	7	02514	1	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		
**	6	02510	2	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		
**	5	02427	1	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING		
4	02029	1	WASHER, LOCK	416000_STEEL_GRADE_A2			
3	02028	13	WASHER, LOCK	416000_STEEL_GRADE_A2			
2	01717	7	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70			
1	01465	4	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70			

SPARE	ITEM NO	PART No.	QTY	DESCRIPTION	MATERIAL	DRAWING NO.
PRODUCT LINE		HT				
TYPE / FRAME		HT-50-MS				
SCALE		0.350				
DRAWN	CDM	DATE	10-MAY-17			
CHKD.		DATE				
APPVD.	NJG	DATE	10-MAY-17			
REPLACES						
REPLACED BY						

HT-50-MS SECTIONAL DRAWING		DRAWING NO. HT-50-MS	REV. 1
		SHEET: 2 OF 2	

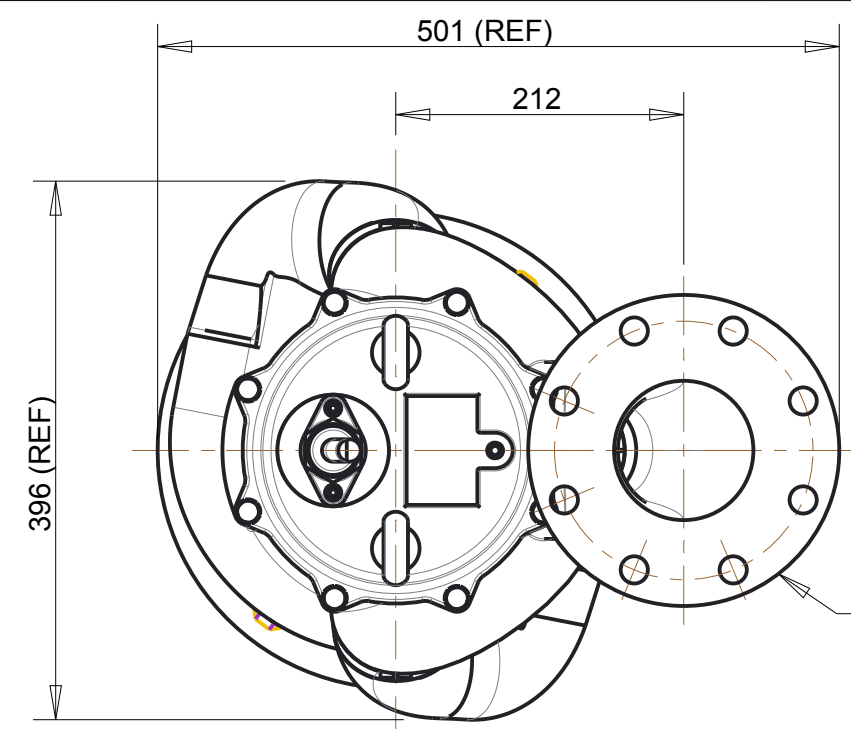
Auto Drawing Format B, 4 mm, in millimeters (mm) unless otherwise stated.

File Name	HT-50-MS
File	ASSEM
Version Modified On	12-Jun-18 02:38:26 PM
Released	12-Jun-18 02:38:26 PM

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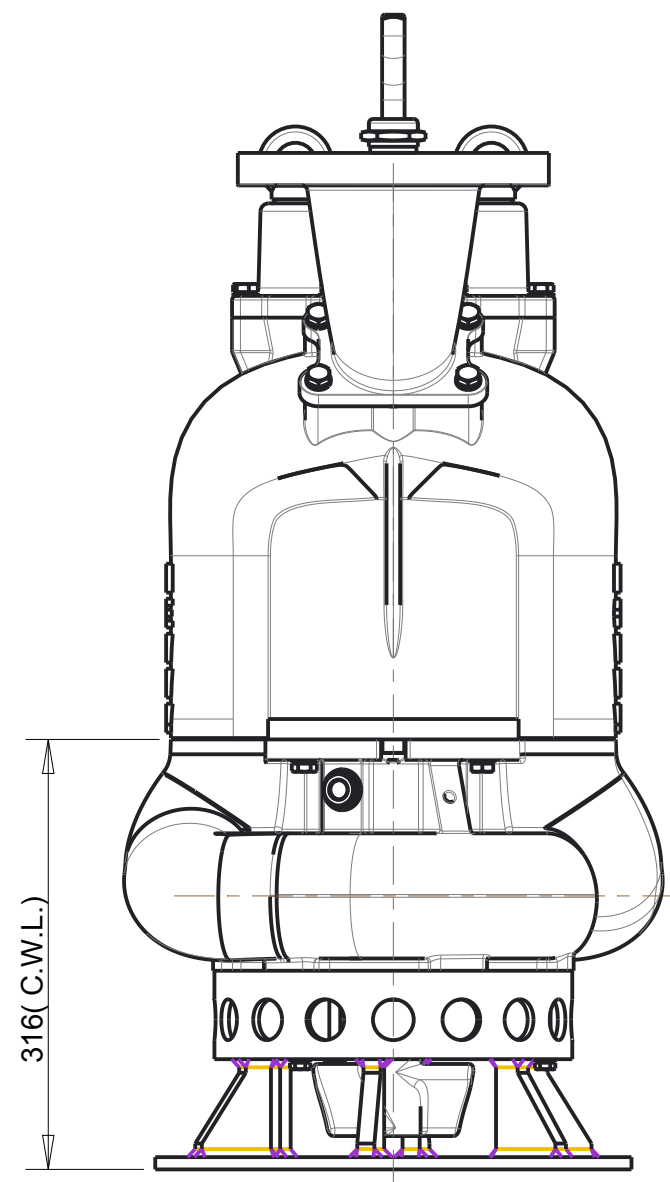
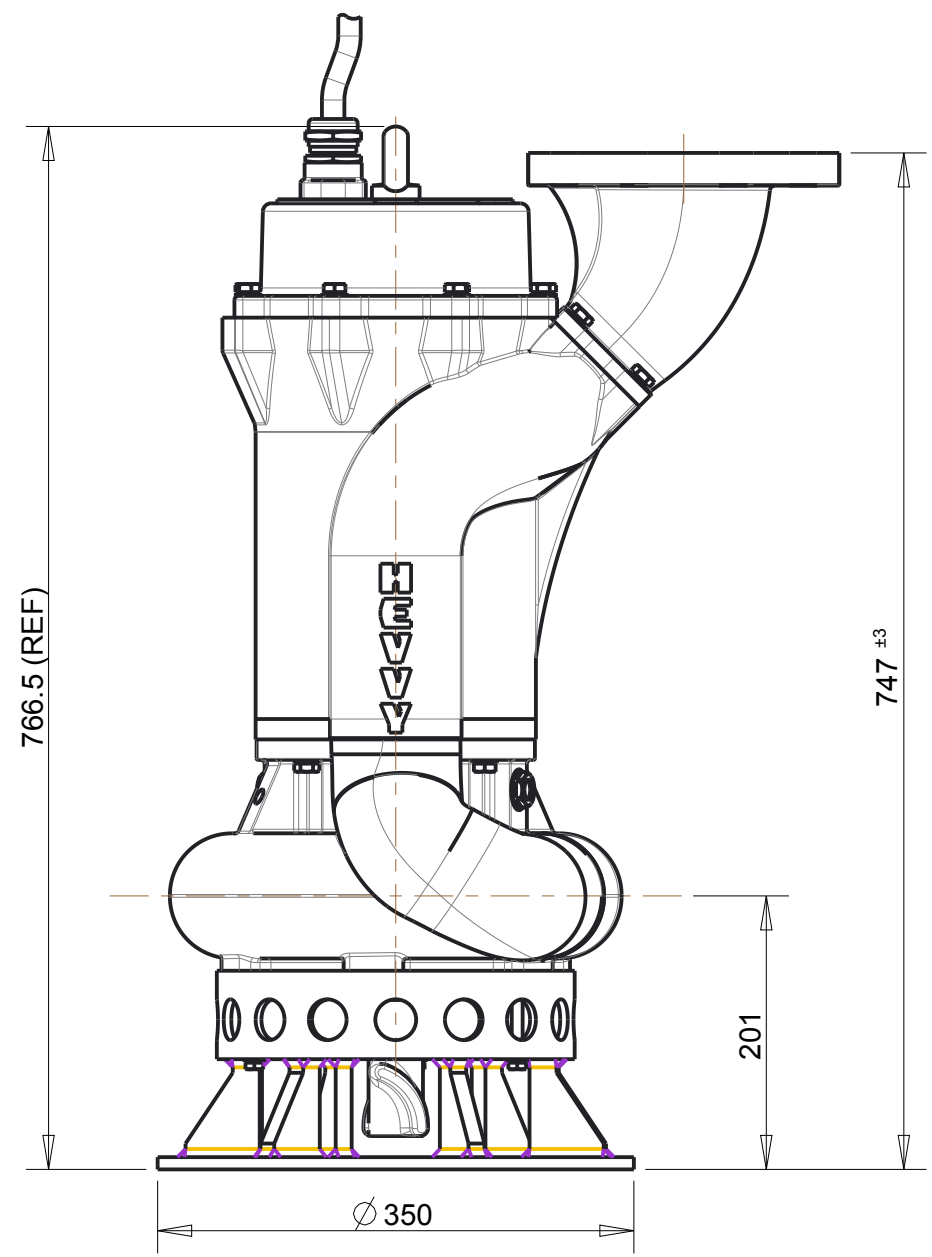
File Name	Revision Modified On	Release Level
HT-100	19-Jun-18 02:18:52 PM	In Work
ASSEM	19-Jun-18 01:54:28 PM	Released

Circle Drawing Format B
 All dimensions in millimeters
 (mm) unless otherwise stated.

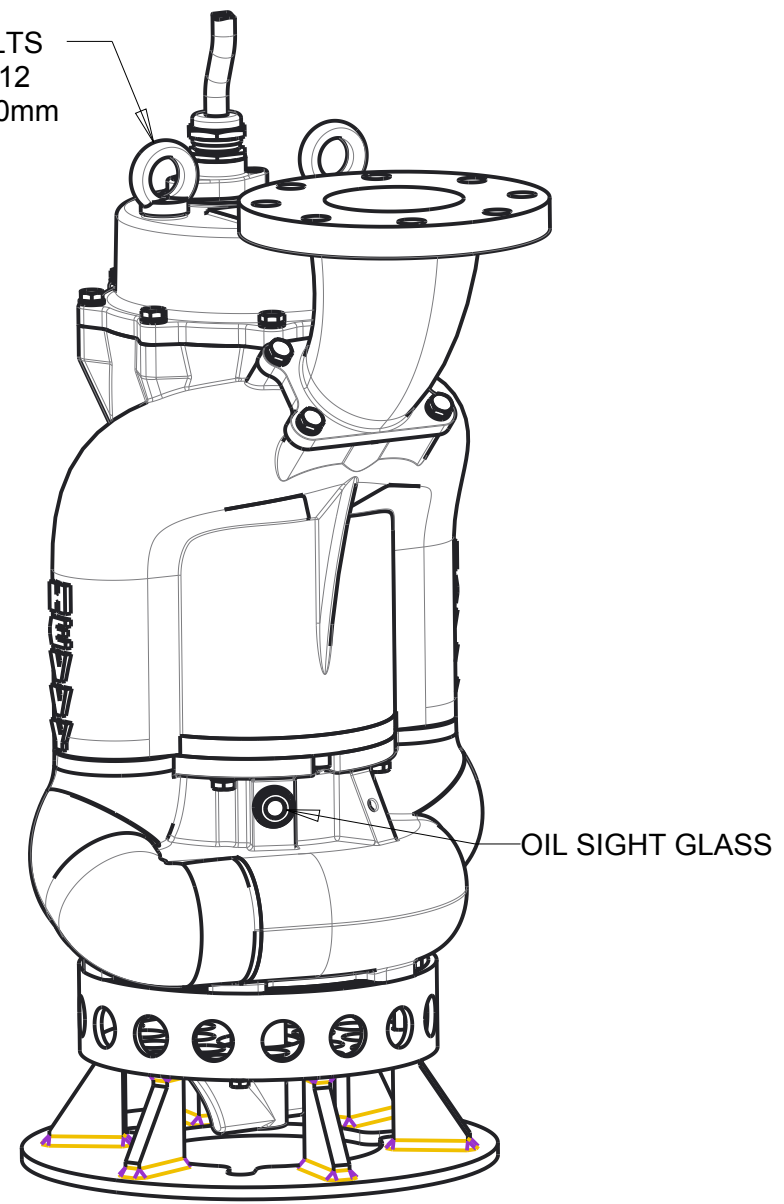


NOTES:

1. CONTINUOUS RUNNING WATER LEVEL (C.W.L.)
2. ISO VG 32 OIL USED IN THE SEAL BOX
3. 650ml OIL QUANTITY



LIFTING EYE BOLTS
 DIN 580 C15 M12
 ID Ø 30mm



REV	ECN	ZONE	CHANGE DESCRIPTION	BY	APPROVED	DATE
1	-	-	REVISED DRAWING TO AS BUILT	CDM	-	20 JUL 15
2	-	-	REVISED TITLE, DRAWING NO. & TYPE/FRAME FROM HNS-7.5 TO HT-7.5 AND ADDED CRITICAL/RECOMMENDED SPARES DESIGNATIONS	KL	CDM	4 JAN 16
3	-	-	REVISED SHEET 2	CDM	-	8 JUN 16
4			REVISED MODEL NUMBER, WAS HT-7.5. ADDED CABLE ASSEMBLY NUMBER.	CDM	NJG	19 JUN 18

PRODUCT LINE	HT
TYPE / FRAME	HT-7.5
SCALE	0.180
DRAWN	CDM
DATE	29-APR-14
CHKD.	
DATE	
APPVD.	NJG
DATE	29-APR-14
REPLACES	
REPLACED BY	

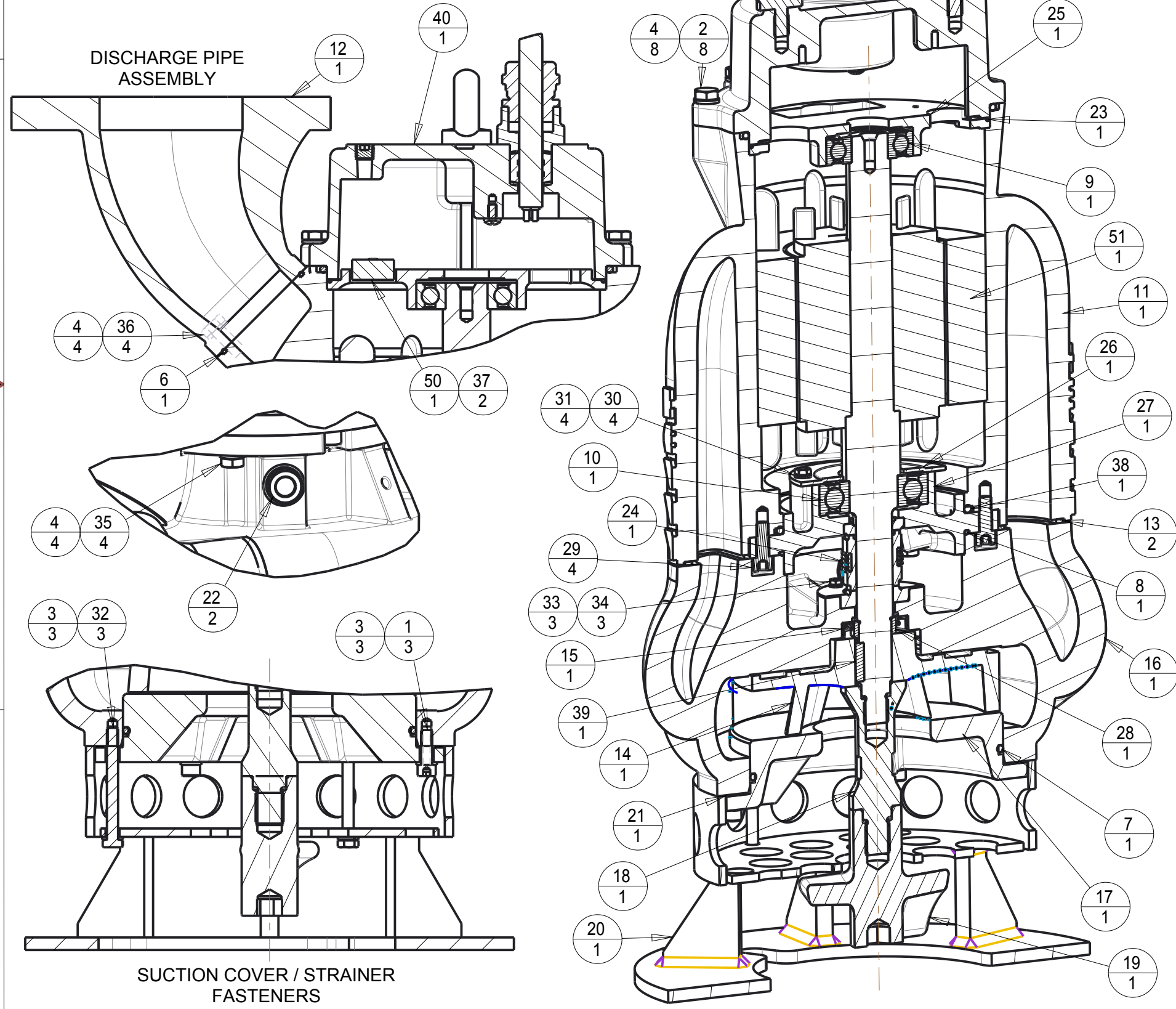
TITLE		DRAWING NO.	REV.
HT-7.5 OUTLINE DRAWING		HT-100	4
		SHEET: 1 OF 2	

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TABLE A

PUMP P/N	DESCRIPTION	ITEM 50 MT PROTECTOR	ITEM 51 STATOR/ROTOR	ITEM 17 SUCTION COVER	ITEM 16 PUMP CASING
24660	HT-100-380-60	26419	26368	N/A	N/A
29167	HT-100-380-60-HC			28968	28969
24654	HT-100-460-60	26415	26369	N/A	N/A
29164	HT-100-460-60-HC			28968	28969
24657	HT-100-575-60	26418	26370	N/A	N/A
29166	HT-100-575-60-HC			28968	28969

ESTIMATED PUMP WEIGHT = 150 KG



NOTES:
 1. * = RECOMMENDED SPARE (3-5 YEARS)
 2. ** = CRITICAL SPARE (0-2 YEARS)

QTY	POS.	PART NO.	DESCRIPTION	MATERIAL	DRAWING NO.	
1	51	SEE TABLE 'A'	STATOR, ROTOR, SHAFT UNIT, HT-100			
1	50	SEE TABLE 'A'	THERMAL PROTECTION, MOTOR			
1	40	30308	ASSEMBLY, CABLE, HT-7.5, SOOW			
**	1	39	27732	KEY, STL	052010_ASTM_A108_GR_1045	
**	1	38	26502	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING	
2	37	26496	SCREW, CROSS RECESSED PAN HEAD	412000_STEEL_GRADE_A2_CLASS_70		
4	36	26483	SCREW, HEX HEAD, FT, CAP	415000_STEEL_GRADE_A4_CLASS_70		
4	35	26482	SCREW, HEX HEAD, FT, CAP	415000_STEEL_GRADE_A4_CLASS_70		
3	34	26481	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70		
3	33	26480	WASHER, LOCK	416000_STEEL_GRADE_A2		
3	32	26479	SCREW, HEX HEAD, PT, CAP	412000_STEEL_GRADE_A2_CLASS_70		
4	31	26471	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70		
4	30	26470	WASHER, LOCK	416000_STEEL_GRADE_A2		
4	29	26469	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70		
**	1	28	26462	SLEEVE, DISTANCE	080010_ASTM_A276_TYPE_304	101T22735135
1	27	26457	HOUSING, MECHANICAL SEAL, HT-100	003000_ASTM_A536_GR_60-40-18	012TK1501505	
1	26	26455	COVER, BEARING	074000_JIS_G_3141_SPCC	021050001025	
1	25	26454	HOUSING, RADIAL BEARING	001000_ASTM_A48_CL_30B	003X12000005	
**	1	24	26361	MECHANICAL SEAL, HT-100	200000_CUSTOM_MATERIAL	
**	1	23	24886	O-RING	162000_NITRILE_70_DURO_O-RING	
2	22	24369	OIL SIGHT GLASS, HNS	081000_ASTM_316SS		
*	1	21	24332_KIT	SHIM, KIT	DN10744	
1	20	24331	STRAINER, HT-100	057000_ASTM_A36	DN10743	
*	1	19	24330	AGITATOR, HT-100	011000_ASTM_A532_CL_III_TYPE_A	DN10742
1	18	24328	SHAFT, STUB	090010_ASTM_A276_TYPE_410	DN10741	
*	1	17	24327	COVER, SUCTION, HT-100	004000_ASTM_A536_GR_65-45-12	DN10740
*	1	16	24325	CASING, PUMP, HT-100	003000_ASTM_A536_GR_60-40-18	DN10738
**	1	15	24311	SEAL, LIP, BUNA	161000_NITRILE_70_DURO_LIP_SEAL	
*	1	14	24310	IMPELLER, HT-100	011000_ASTM_A532_CL_III_TYPE_A	DN10761
**	2	13	24288	GASKET	160000_NITRILE_60_DURO_BUNA-N	DN10760
*	1	12	24285	ELBOW, DISCHARGE	004000_ASTM_A536_GR_65-45-12	DN10757
1	11	24281	HOUSING, STATOR	004000_ASTM_A536_GR_65-45-12	DN10753	
**	1	10	19241	BEARING, DEEP GROOVE BALL		
**	1	9	17765	BEARING, DEEP GROOVE BALL		
**	1	8	06420	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING	
**	1	7	02827	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING	
**	1	6	02502	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING	
2	5	02051	BOLT, EYE	072000_ASTM_A576_GR_1015		
16	4	02029	WASHER, LOCK	416000_STEEL_GRADE_A2		
6	3	02028	WASHER, LOCK	416000_STEEL_GRADE_A2		
8	2	01722	SCREW, HEX HEAD, FT, CAP	415000_STEEL_GRADE_A4_CLASS_70		
3	1	01465	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70		

SPARE QTY POS. PART NO. DESCRIPTION MATERIAL DRAWING NO.

PRODUCT LINE	HT
TYPE / FRAME	HT-7.5
SCALE	0.300
DRAWN	CDM
DATE	11-APR-14
CHKD.	DATE
APPVD.	DATE
REPLACES	
REPLACED BY	

HT-100 SECTIONAL DRAWING		DRAWING NO. HT-100	REV. 4
		SHEET: 2 OF 2	

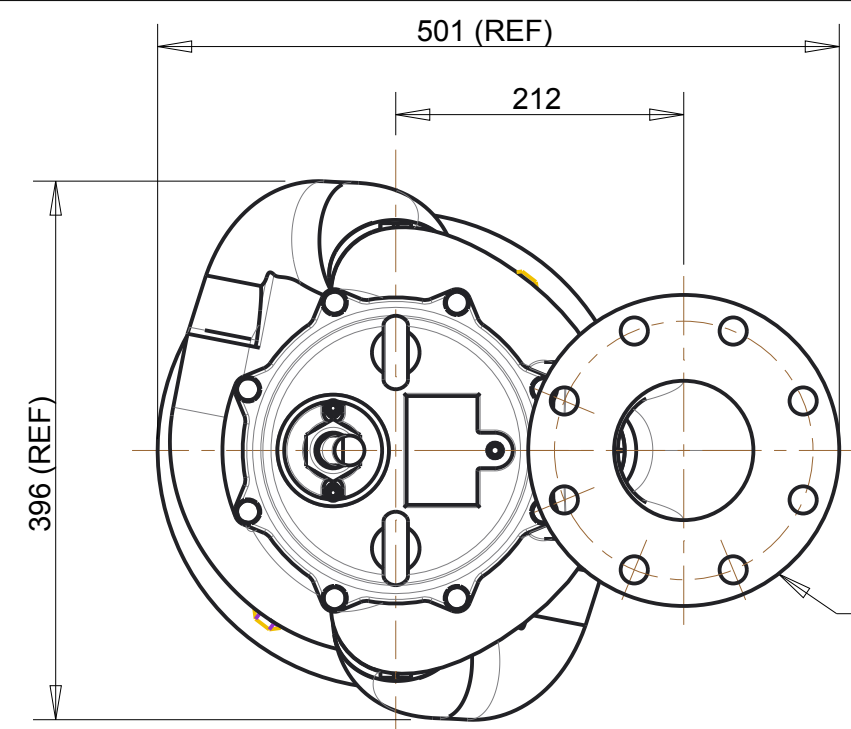
Auto Drawing Format B
 A: Drawing Unit in millimeters
 (mm) unless otherwise stated.

File Name	HT-100
Drawing	ASSEM
Version Modified On	19-Jun-18 02:18:52 PM
Released	19-Jun-18 01:54:58 PM
Release Level	In Work

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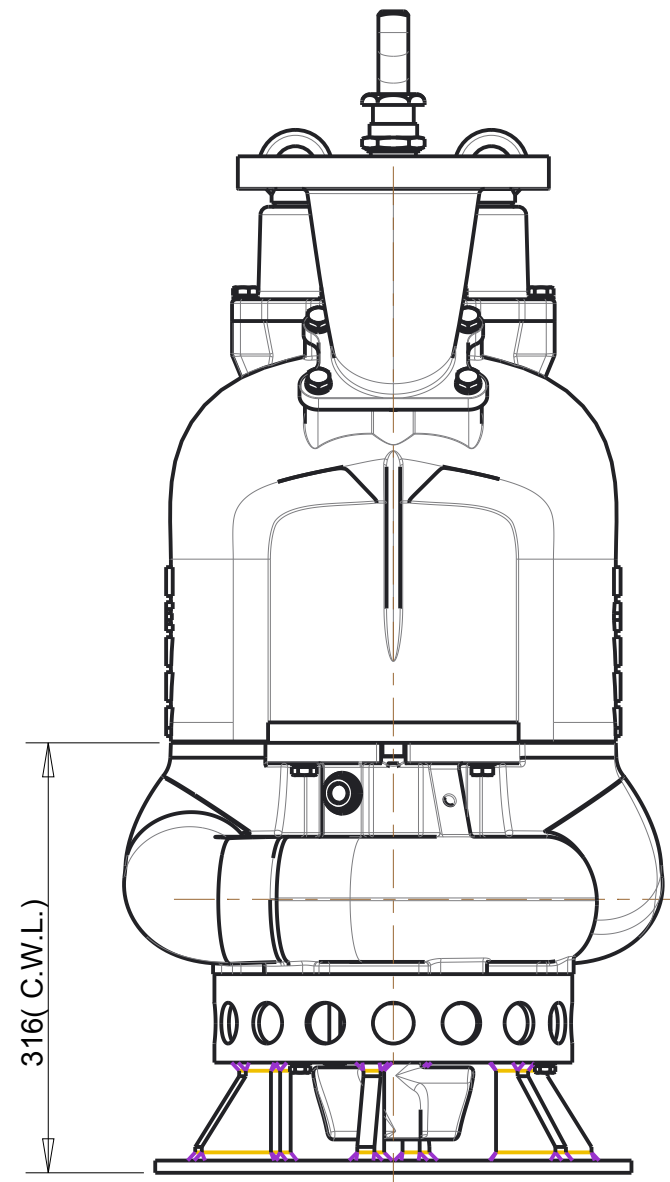
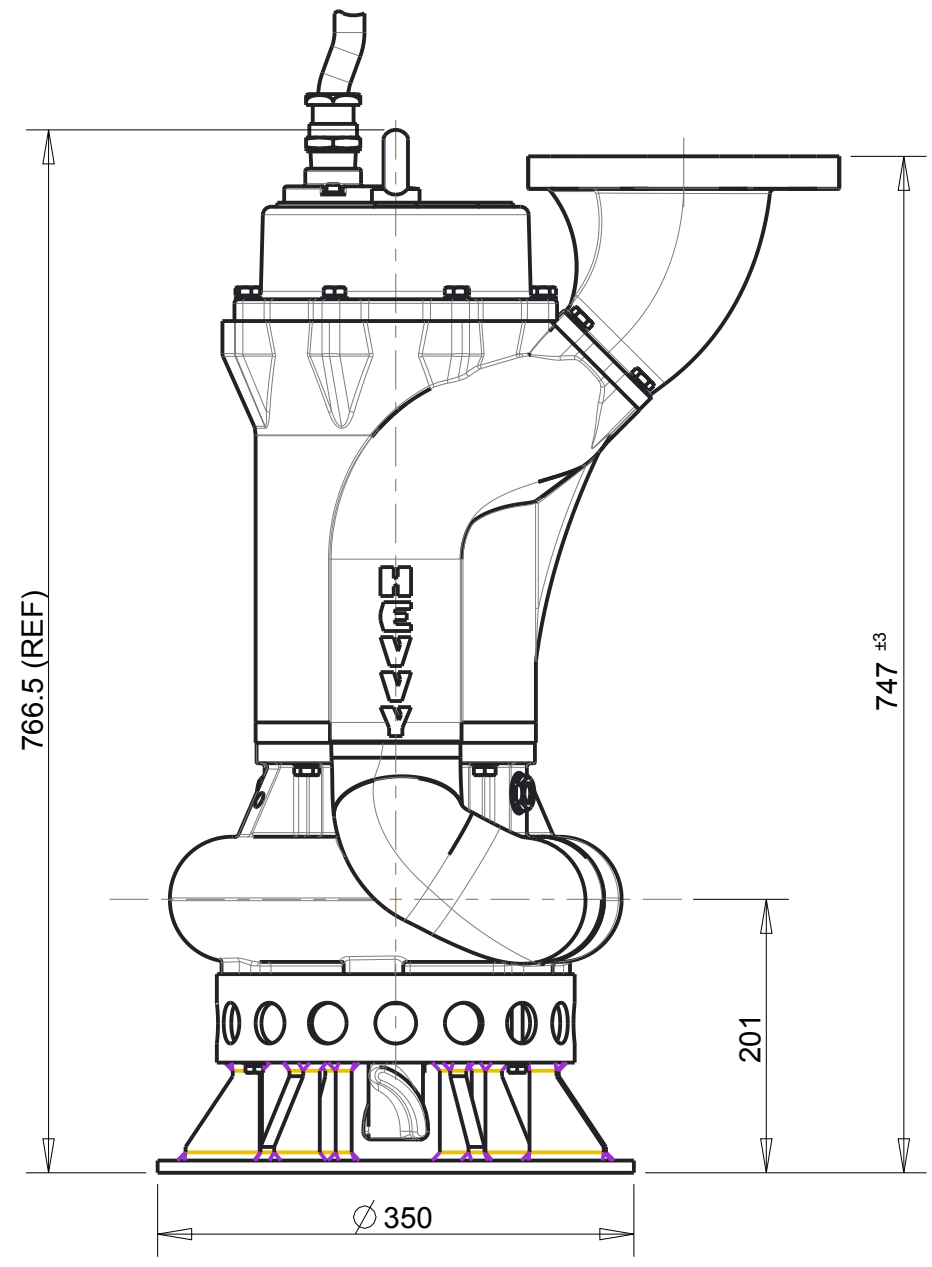
File Name	Revision Modified On	Release Level
HT-100-MS	19-Jun-18 02:12:02 PM	Released
HT-100-MS	19-Jun-18 02:12:02 PM	Released

Circle Drawing Format B
 All dimensions in millimeters
 (mm) unless otherwise stated.



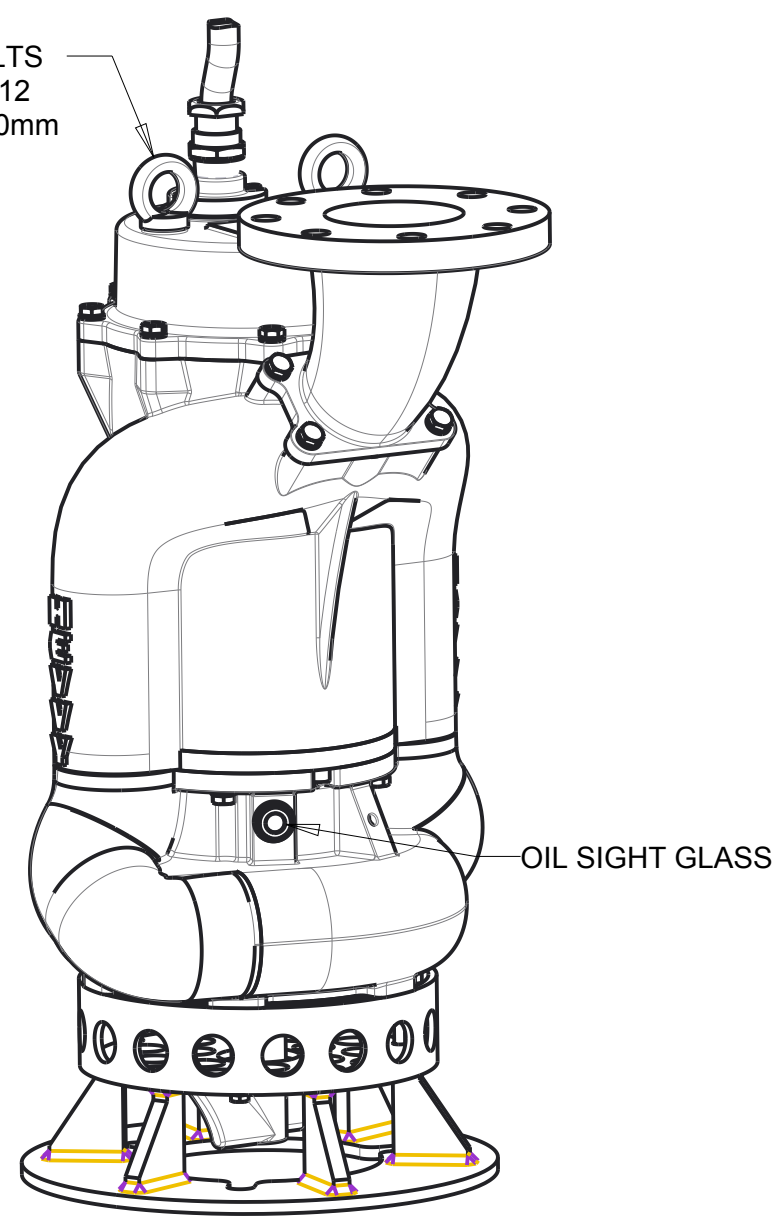
NOTES:

1. CONTINUOUS RUNNING WATER LEVEL (C.W.L.)
2. ISO VG 32 OIL USED IN THE SEAL BOX
3. 650ml OIL QUANTITY



REV	ECN	ZONE	CHANGE DESCRIPTION	BY	APPROVED	DATE
1			REVISED MODEL NUMBER, WAS HT-7.5. ADDED CABLE ASSY P/N.	CDM	NJG	19 JUN 18

LIFTING EYE BOLTS
 DIN 580 C15 M12
 ID Ø 30mm



PRODUCT LINE	HT
TYPE / FRAME	HT-100-MS
SCALE	0.180
DRAWN	CDM
DATE	15-MAY-17
CHKD.	
DATE	
APPVD.	NJG
DATE	15-MAY-17
REPLACES	
REPLACED BY	

TITLE		DRAWING NO.	REV.
HT-7.5-MS OUTLINE DRAWING		HT-100-MS	1
SHEET: 1 OF 2			

4

3

2

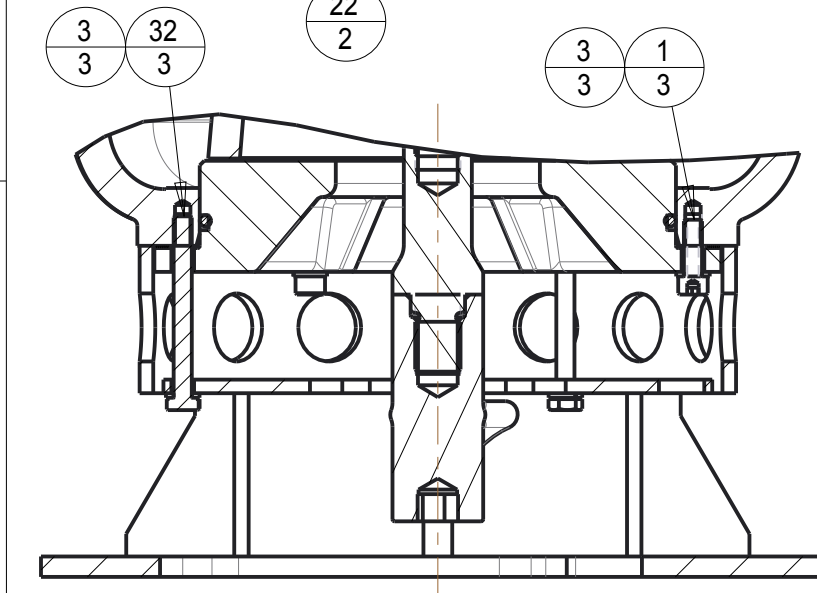
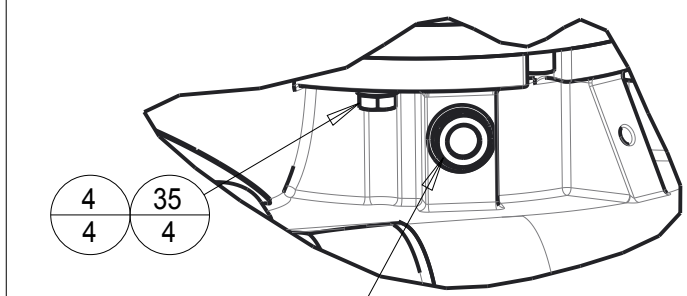
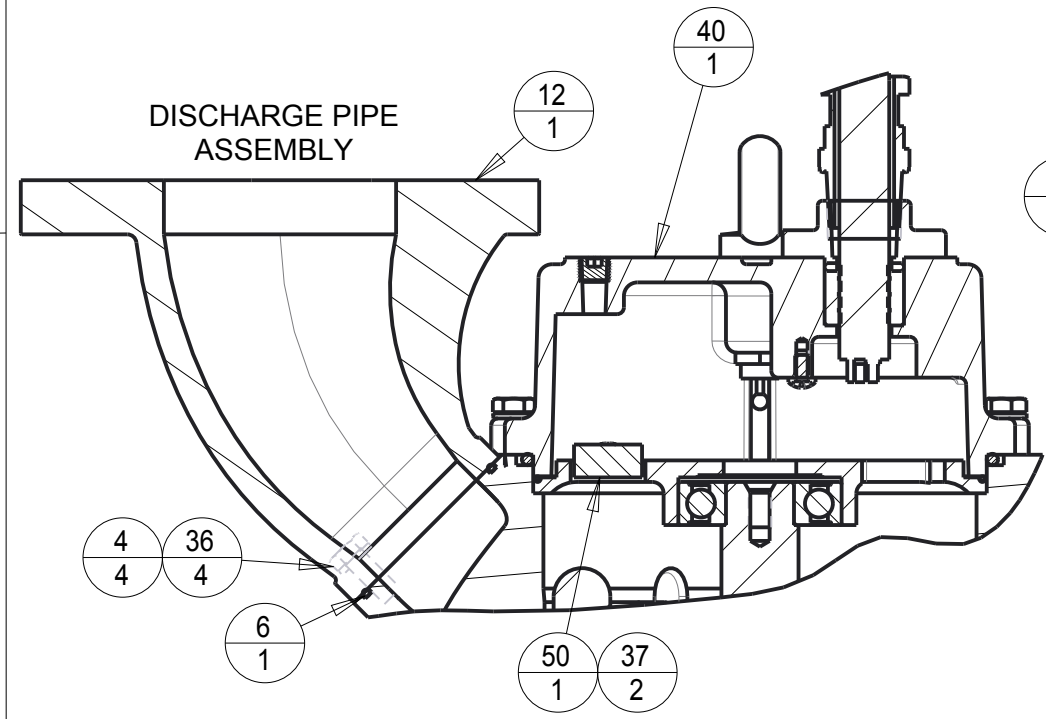
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TABLE A

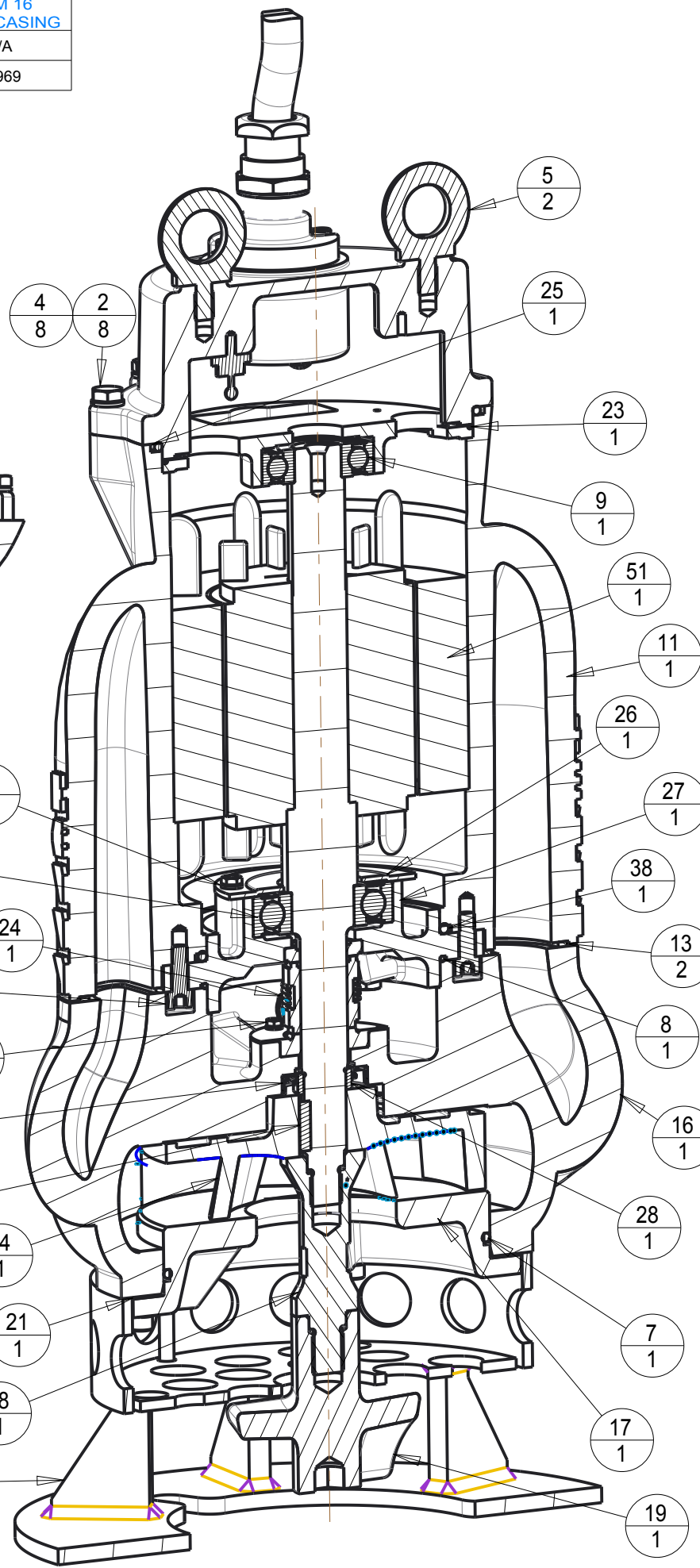
ESTIMATED PUMP WEIGHT = 150 KG

PUMP P/N	DESCRIPTION	ITEM 50 MT PROTECTOR	ITEM 51 STATOR/ROTOR	ITEM 17 SUCTION COVER	ITEM 16 PUMP CASING
29088	HT-100-575-60-MS	26419	26368	N/A	N/A
29178	HT-100-575-60-MS-HC			28968	28969

- NOTES:
 1. * = RECOMMENDED SPARE (3-5 YEARS)
 2. ** = CRITICAL SPARE (0-2 YEARS)



SUCTION COVER / STRAINER FASTENERS



QTY	POS.	PART NO.	DESCRIPTION	MATERIAL	DRAWING NO.			
1	51	SEE TABLE 'A'	STATOR, ROTOR, SHAFT UNIT, HT-100					
1	50	SEE TABLE 'A'	THERMAL PROTECTION, MOTOR					
1	40	30307	ASSEMBLY, CABLE, HT-100, SHD-GC					
**	1	39	27732	KEY, STL	052010_ASTM_A108_GR_1045			
**	1	38	26502	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING			
2	37	26496	SCREW, CROSS RECESSED PAN HEAD	412000_STEEL_GRADE_A2_CLASS_70				
4	36	26483	SCREW, HEX HEAD, FT, CAP	415000_STEEL_GRADE_A4_CLASS_70				
4	35	26482	SCREW, HEX HEAD, FT, CAP	415000_STEEL_GRADE_A4_CLASS_70				
3	34	26481	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70				
3	33	26480	WASHER, LOCK	416000_STEEL_GRADE_A2				
3	32	26479	SCREW, HEX HEAD, PT, CAP	412000_STEEL_GRADE_A2_CLASS_70				
4	31	26471	SCREW, HEX HEAD, FT, CAP	412000_STEEL_GRADE_A2_CLASS_70				
4	30	26470	WASHER, LOCK	416000_STEEL_GRADE_A2				
4	29	26469	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70				
**	1	28	26462	SLEEVE, DISTANCE	080010_ASTM_A276_TYPE_304 101T22735135			
1	27	26457	HOUSING, MECHANICAL SEAL, HT-100	003000_ASTM_A536_GR_60-40-18	012TK1501505			
1	26	26455	COVER, BEARING	074000_JIS_G_3141_SPCC	021050001025			
1	25	26454	HOUSING, RADIAL BEARING	001000_ASTM_A48_CL_30B	003X12000005			
**	1	24	26361	MECHANICAL SEAL, HT-100	200000_CUSTOM_MATERIAL			
**	1	23	24886	O-RING	162000_NITRILE_70_DURO_O-RING			
2	22	24369	OIL SIGHT GLASS, HNS	081000_ASTM_316SS				
*	1	21	24332_KIT	SHIM, KIT		DN10744		
1	20	24331	STRAINER, HT-100	057000_ASTM_A36		DN10743		
*	1	19	24330	AGITATOR, HT-100	011000_ASTM_A532_CL_III_TYPE_A		DN10742	
1	18	24328	SHAFT, STUB	090010_ASTM_A276_TYPE_410			DN10741	
*	1	17	24327	COVER, SUCTION, HT-100	004000_ASTM_A536_GR_65-45-12			DN10740
*	1	16	24325	CASING, PUMP, HT-100	003000_ASTM_A536_GR_60-40-18			DN10738
**	1	15	24311	SEAL, LIP, BUNA	161000_NITRILE_70_DURO_LIP_SEAL			
*	1	14	24310	IMPELLER, HT-100	011000_ASTM_A532_CL_III_TYPE_A			DN10761
**	2	13	24288	GASKET	160000_NITRILE_60_DURO_BUNA-N			DN10760
*	1	12	24285	ELBOW, DISCHARGE	004000_ASTM_A536_GR_65-45-12			DN10757
1	11	24281	HOUSING, STATOR	004000_ASTM_A536_GR_65-45-12				DN10753
**	1	10	19241	BEARING, DEEP GROOVE BALL				
**	1	9	17765	BEARING, DEEP GROOVE BALL				
**	1	8	06420	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING			
**	1	7	02827	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING			
**	1	6	02502	O-RING, BUNA	162000_NITRILE_70_DURO_O-RING			
2	5	02051	BOLT, EYE	072000_ASTM_A576_GR_1015				
16	4	02029	WASHER, LOCK	416000_STEEL_GRADE_A2				
6	3	02028	WASHER, LOCK	416000_STEEL_GRADE_A2				
8	2	01722	SCREW, HEX HEAD, FT, CAP	415000_STEEL_GRADE_A4_CLASS_70				
3	1	01465	SCREW, SKT HEAD, CAP	412000_STEEL_GRADE_A2_CLASS_70				

SPARE QTY	POS.	PART NO.	DESCRIPTION	MATERIAL	DRAWING NO.
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PRODUCT LINE	HT		
TYPE / FRAME	HT-100-MS		
SCALE	0.300		
DRAWN	CDM	DATE	15-MAY-17
CHKD.		DATE	
APPVD.	NJG	DATE	15-MAY-17
REPLACES			
REPLACED BY			

TITLE		DRAWING NO.	REV.
HT-100 SECTIONAL DRAWING		HT-100-MS	1
SHEET: 2 OF 2			

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 Release Level: Released
 Released Date: 19-Jun-18 02:12:02 PM
 19-Jun-18 02:12:02 PM
 File Name: HT-100-MS
 HT-100-MS
 Drawing: ASSEM

Size Drawing Format: B
 A: 4 in, 100 millimeters (mm) unless otherwise stated.