EBSRAY PUMPS

MD & HD Series
All Models
.....for Industrial Applications

Quality Endorsed Company
ISO 9001
Lic 3332
Standards Australia

EBSRAY AUSTRALIA
The EBSRAY MD & HD Series of Internal Gear Pumps are a range of medium and heavy duty, positive displacement pumps suitable for handling a diverse variety of products covering a wide range of viscosities, temperatures, flows and pressures.

**Fields of Application**
EBSRAY Internal Gear Pumps are widely used and preferred in numerous and diverse industrial pumping applications including:

- Petroleum/fuel oil industry.
- Plastics manufacture.
- Paint manufacturing.
- Chemical industry.
- Road tanker liquids transfer.
- Bitumen road sealing.
- Defence.
- Heavy industry.
- Power stations.
- Food processing.
- Public utilities.
- Mining Industry.

**Features**
- Reliable operation – time proven principle
- Rugged Heavy Duty construction.
- Ease of maintenance - only two major moving pumping elements.
- Optional standard configurations and builds available to suit a wide range of applications.
- Quiet operation.
- Integral and In-Line Relief/Bypass Valves.
- Low NPSH_R capability.

**Special Constructions**
Contact EBSRAY or your local Representative for advice on alternate arrangements to meet applications not outlined in this publication.

**Assured Quality and Performance**
EBSRAY’s ISO 9001 Quality System assures compliance with high safety and quality standards. All Ebsray MD & HD Series pumps & pumpsets are manufactured under strict guidelines and procedures. Quality inspections and tests during production guarantee pump integrity and pumping performance in accordance with the specifications.
Pumping Principle

1. Induction (Inlet)
As the Outer Rotor rotates, the Inner Rotor is driven in the same direction. The volume between the teeth increases as the rotor teeth move out of mesh, creating a partial vacuum. The resultant reduction in differential pressure causes the liquid to enter through the inlet port, filling the space between the teeth of the two rotors.

2. Transfer
While rotation continues, the liquid between the rotor teeth is carried towards the discharge port. During this transfer stage, the inside of the Outer Rotor teeth and the outside of the Inner Rotor teeth are sealed by the Crescent. The Rotors are also sealed between the bore of the pump Body (Casing) and the Cover.

3. Discharge
Once past the Crescent, the teeth begin to move into mesh again, reducing the volume between the two rotors and thereby forcing the liquid from the tooth cell and out of the pump via the discharge port. Flow is smooth and continuous.

Major Benefits of EBSRAY MD & HD Series Pumps

- Only two major moving pumping elements.
- Excellent self priming and vapour-clearing ability.
- Smooth even flow without pulsation or surging.
- Ideal pumping principle for either viscous or non-viscous liquids.
- High overall efficiency.
- Reversible operation.
- Negligible axial thrust due to hydraulic balance.
- High pressure capability.
- Cushioned positive flow movement of liquids.
- The principle tends to be self compensating for wear, allowing for normal predictable operation over an extended service life.

Pump Efficiency

Being of the “Internal Gear Principle”, all EBSRAY MD & HD Series pumps will operate efficiently over a wide range of pressures, viscosities and speeds.

A typical illustration is shown in the graph opposite. The graph shows typical performance of HD Series pump model HD300.

Speed = 300 RPM
Kinematic Viscosity = 63 cSt.
Applications

Fully jacketed HD Series pump fitted with cartridge mount mechanical seal on 24 hour pitch recirculation service in Aluminium smelter. These pumps replaced opposition manufactured pumps running at identical speeds which needed complete reconditioning every 6 months. The Ebsray replacement pumps have needed only minor maintenance every three years!

Special MD Series Stainless Steel API 676 compliant pumpsets fitted with double cartridge mount mechanical seals and pressurised barrier liquid tanks for ABS/SAN chemical process plant.

Model MD 200 pumpsets installed in a modern environmentally friendly, high efficiency oil and solvent transfer installation.

Heavy Duty Grease transfer pump in a major lubricant blending plant where all pumps were designed, manufactured and supplied by EBSRAY.
Applications

Heat traced crude oil pumps for rail tanker unloading service fitted with cartridge style mechanical seals and spacer couplings for ease of maintenance. These pumps discharge 1,000,000 litres per day through 2.5 kilometres of heat traced discharge line. The system also incorporates EBSRAY In-Line type Bypass Valves for protection from excessive pressure rise.

Two of six crude palm oil transfer pumps for tanker unloading in palm oil refinery. These pumps have been in continuous service for 15 years with virtually no maintenance required.

Oil recirculating pump for critical lubrication duty on a rock crusher. Hundred of EBSRAY pumps are used in this application throughout the Mining and Quarrying industries where reliability, low noise level, and long service life are the prime selection criteria.

Factory fitted fully electric heat traced and lagged Model MD 300 bitumen pumps with automatic temperature sensing and control.
**General Description**

Throughout the MD & HD Series, all models follow a similar build arrangement. The Bracket is strongly constructed and serves the purpose of rigidly supporting and maintaining the alignment of the Rotor on Shaft assembly, the Rotor Bearing, the Shaft Seal and the Ball Bearing with its associated axial clearance adjustment mechanism. The design of this adjustment mechanism allows simple, positive and precise setting of the axial clearance between the Rotors and the Cover. The Bracket is normally of the same material as the Casing and Cover assuring maximum compatibility and strength for pumps made from special materials. The Bracket has fully machined mounting feet with precision drilled holes for ease of accurate and repeatable alignment and secure pump location. The Body and Cover which encase the rotating pumping elements may be fitted with a number of standard options including various porting arrangements, bolt-on Relief Valves and Heating/Cooling Jackets etc. The EBSRAY MD & HD Series of pumps are a truly universal design for many standard and specialised duties.

**Features**

1. **Bracket - Standard Type**
   - Robust construction for accurate alignment and rigidity.
   - Jacketing for heating or cooling available as standard option.
   - Precision machined spigot for accurate Body/Bracket alignment and concentricity.
   - Brackets designed to accept various pump sizes and models.

2. **Shaft Sealing**
   - Mechanical Seal either EBSRAY or commercial, shaft mount or cartridge mount available.
   - Seal scavenger/flushing available, removes heat from seal faces and induces flow of fresh liquid through Rotor Bearing, Rotor API Plans.
   - Packed Gland optional with Lantern Ring.
   - API plans for optimum Rotor Seal performance.

3. **Heavy Duty Ball Bearing**
   - Large angular contact Ball Bearings, grease lubricated to accurately locate and control axial clearance.
   - Sized to also take radial loads of belt or chain drives.
   - Bearing Carrier or Lockrings ensure simple and precise axial Rotor clearance adjustment.
   - No special tools or measurement equipment required for adjustment.

4. **Rotor on Shaft Assembly**
   - Precision machined for concentricity.
   - Large diameter Shaft - low deflection, high torque capacity.
   - Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
   - Material options to suit application and duty.

5. **Inner Rotor Pin**
   - Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
   - Optional pressure fed product lubrication or from external source for arduous applications.
   - Easily fitted.
   - Positively located and can be drawn into position by Inner Rotor Pin locking nut.
   - Material Options to suit application and duty.

6. **Relief/Bypass Valve**
   - Material options to suit application and duty.
   - Balanced or poppet design Valves.
   - Full flow operation - low pressure-rise.
   - Integral on pump (relief) or In-Line (bypass) Valves available.
   - Can be fitted to all non-jacketed models and most jacketed models.
   - External adjustment for varying pressures (within range of fitted spring).

7. **Body**
   - Many porting configurations available - flanged or screwed, 90° or 180°.
   - Heating jackets available in certain models.
   - Gauge tappings standard.
   - Horizontal or vertical inlet.

8. **Valve Adjustment**
   - Fully adjustable within spring range.
   - Easy external access, simple to adjust.
   - Valve setting cannot be adjusted to eliminate protection (i.e. Valve function cannot be locked out).
   - Optional tamper proof sealing arrangement.

9. **Cover**
   - Optional heating jacket.
   - Standard pump Cover may be simply converted to a heating jacket arrangement by fitment of a cover plate and extended Inner Rotor Pin.

10. **Spring**
    - Selection of Springs and materials available to suit differential pressure and/or temperature range required.
Shaft Sealing Options

API seal flush plans available: 02, 11, 13, 32, 51, 52, 53, 54, 61 & 62. For other flush plans please contact EBSRAY or your local Representative.

Standard Packed Gland with Lantern Ring fitted

- Single Mechanical Seal
- Multi Spring Mechanical Seal
- Bellows type Mechanical Seal

- Single Mechanical Seal with Lip Seal for barrier fluid
- Single Mechanical Seal and Bearing isolated with Lip Seal
- Double Mechanical Seal
- Tandem Mechanical Seal

Cartridge Type Mechanical Seal arrangement. Available as: Single, Double, Tandem, Steam Quenched, Throttle bush type etc.
Bracket - Cartridge Type
- Robust construction for accurate alignment and rigidity.
- Jacketing as illustrated for heating or cooling available as standard option.
- Precision machined spigot for accurate Body/Bracket alignment and concentricity.
- Brackets designed to accept various pump sizes and models.

Heavy Duty Ball Bearing
- Large angular contact Ball Bearings, grease lubricated to accurately locate and control axial clearance. Sized to also take radial loads of belt or chain drives.
- Bearing Carrier or Lockings ensure simple and precise axial Rotor clearance adjustment. No special tools or measurement equipment required for adjustment.

Shaft Sealing
- Mechanical Seal either EBSRAY or commercial, shaft mount or cartridge mount available.
- Seal scavenger/flushing available, removes heat from seal faces and induces flow of fresh liquid through Rotor Bearing.
- Packed Gland optional with Lantern Ring.
- API plans for optimum Shaft Seal performance.

Bracket for Cartridge Mechanical Seal
Optional Cartridge Type Bracket for insertion and removal of the Mechanical Seal through the rear of the Bracket. A spacer type coupling allows the Mechanical Seal to be serviced without removal of the pump or driver from the installation. A heavy duty Double Row Ball Bearing accurately controls axial location of Outer Rotor.

Bracket and/or Body may be cast with integral jacketing for efficient heat transfer using oil, steam etc. Special connections can be provided for heating (or cooling) jackets to suit the plant system requirements.

Features

Rotor on Shaft Assembly
- Precision machined for concentricity.
- Large diameter Shaft - low deflection, high torque capacity.
- Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
- Material options to suit application and duty.

Rotor Bearings
- Material options to suit application and duty.
- Large journal diameter for extended life.
- Induced product flow through bearing with optional Flush Plan for additional lubrication and cooling.

Shaft Sealing
- Mechanical Seal either EBSRAY or commercial, shaft mount or cartridge mount available.
- Seal scavenger/flushing available, removes heat from seal faces and induces flow of fresh liquid through Rotor Bearing.
- Packed Gland optional with Lantern Ring.
- API plans for optimum Shaft Seal performance.

Inner Rotor Pin
- Case hardened as standard or hard metal sprayed journal areas for optimum bearing surfaces.
- Optional pressure-fed product lubrication or from external source for arduous applications.
- Easily fitted.
- Positively located and can be drawn into position by Inner Rotor Pin locking nut.
- Material Options to suit application and duty.

Relief/Bypass Valve
- Material options to suit application and duty.
- Balanced or poppet design Valves. Model dependent
- Full flow operation - low pressure-rise.
- Integral on pump (relief) or In-Line (bypass) Valves available.
- Can be fitted to all non-jacketed models and most jacketed models.
- External adjustment for varying pressures (within range of fitted spring).

Body
- Many porting configurations available
  - flanged or screwed, 90° or 180°.
- Heating jackets available in certain models.
- Gauge tappings standard.
- Horizontal or vertical inlet.

Valve Adjustment
- Fully adjustable within spring range.
- Easy external access, simple to adjust.
- Valve setting cannot be adjusted to eliminate protection (i.e. Valve function cannot be locked out).
- Optional tamper proof sealing arrangement.

Spring
- Selection of Springs and materials available to suit differential pressure and/or temperature range required.
Ebsray manufacture a large range of Integral (bolt-on) Relief Valves for pump or system protection to suit all pumps in the MD & HD range. Ebsray also manufacture In-Line Bypass Valves and special purpose valves to suit many different pumping applications.

**Integral Relief Valves**
Designed for direct mounting (bolt-on) to the pump Cover providing protection against excessive differential pressure rise in the pump and system. These fully adjustable Relief Valves are designed to handle full flow capacity of the pump against closed discharge conditions.

Dual Integral Relief Valves may be manifolded for bi-directional pump rotation offering protection in both flow directions.

**In-Line Bypass Valves**
Ebsray In-Line Bypass Valves are ideally suited for return-to-tank applications and where Integral Relief Valves would be unsuitable e.g. to reduce heat build up due to short circuit recirculation within the pump on high pressure high flow applications.

**Special Purpose In-Line Valves**
Ebsray In-Line PFM (Pressure and Flow Modulating) Valves are ideal for applications where constant pressure, flow control or remote operation is required e.g. filling line/packaging applications. PFM Valves may be hydraulically or pneumatically actuated to maintain preset system conditions responding to manual or automatic external control.

**Baseplates**
Ebsray designs and manufactures standard Baseplates and Baseplates complying with API 676 or other standards and specifications as required. Ebsray engineered Baseplates are fabricated to exacting requirements and machined to precise tolerances ensuring accurate alignment of pump, driver, transmission etc.
Arrangements

Customised Pumps and Pumpset arrangements designed and manufactured by Ebsray to suit customer and system requirements.

Special API 676 compliant jacketed pumpset for refinery service. Fitted with special drive arrangement for minimal "footprint".

Jacketed vertical inlet pumpset with mechanical variable speed drive for the manufacture of polymerised bitumen. This pump is used for metering/blending in conjunction with a similarly configured Ebsray bitumen pump.

Twin (left and right hand) HD 600 (150mm) Pumpsets V-belt driven for pumping molasses in a sugar refinery. Optimal space utilisation with pipework.

Fully jacketed pitch pump fitted with cartridge style mechanical seal for use in Aluminium smelter.

API 676 compliant pumpset for sour water service in refinery, complete with hydraulic variable speed drive.
Arrangements

API 676 compliant steam turbine driven hydraulic variable speed drive pumpset for refinery service.

Hot water Jacketed Chocolate Pump fitted with special isolated Rotor Bearing together with integral lubrication system and other special features.

API 676 compliant oil additive transfer/circulation pumpset for blend plant service

Vertical column mount submersible hydrocarbon pump for use in chemical plant.

Special dual rotation transformer oil filtration unit for use in a power station. Fitted with dual Relief Valve arrangement for over pressure protection in both directions.
Pump Size Selection

For quick selection of the most economical size MD or HD Series pump, knowing the flow (L/min) and the Kinematic Viscosity (cSt), refer to the pump size selection graph above.

Example: (Follow dotted line above)
To find the ideal pump size for:
Flow = 220 L/min
Kinematic Viscosity = 1500 cSt.

The intersection of the two dotted lines occurs in the area of the Model MD & HD 200 pump.

Pump Duty Power/Speed Determination
To determine the duty power and speed, refer to the chart/graph of the specific pump Model selected.

The following Notes must be considered for correct determination:

Notes:
1. Model selection may be affected by discharge pressure (Casing pressure), Differential pressure (Bearing loading), Viscosity of product (Shaft size/torque limitations). Check with technical data, EBSRAY or your local Representative as required.

2. All pump models selected are dependant upon adequate NPSHA for correct, optimum performance and operation.

3. For Kinematic Viscosity greater than 10,000 cSt we recommend conferring directly with EBSRAY or a local Representative.

4. For Flows Greater than 5000 L/min, refer to EBSRAY or a local Representative.

5. For flows less than 10 L/min, refer to EBSRAY Z Series selection graph.

6. Internal pump clearances will affect Hydraulic Slip. Therefore, Slip must be considered for final pump speed determination in every selection. Clearances will be determined by: a) pump casing/rotor materials selected, and/or, b) product temperature, and/or, c) product viscosity.

7. For applications involving Abrasive or Shear-Sensitive Liquids, refer to EBSRAY or a local Representative.
Materials of Construction

This table of major components is general and some materials may only be available in specific models.

For special materials not outlined, or not shown as available, please contact EBSRAY or your local Representative.

Integral Relief Valves are supplied in materials suited to the pump construction and pumpage compatibility requirements.

(For In-Line type Bypass Valves refer to EBSRAY)

*= MATERIALS AVAILABLE.

---

Dimensions - Weights

<table>
<thead>
<tr>
<th>PUMP MODEL</th>
<th>PORT DIMENSIONS (millimetres)</th>
<th>APPROXIMATE BARE SHAFT PUMP WEIGHT WITH INTEGRAL RELIEF VALVE FITTED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NOMINAL PIPE SIZE (DN) mm</td>
<td>SCREWED PORTS (See note 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>MD340M</td>
<td>20 - 3/4&quot;</td>
<td>76</td>
</tr>
<tr>
<td>MD340M</td>
<td>25 - 1&quot;</td>
<td>76</td>
</tr>
<tr>
<td>MD100M</td>
<td>25 - 1&quot;</td>
<td>76</td>
</tr>
<tr>
<td>MD100M</td>
<td>32 - 1 1/4&quot;</td>
<td>76</td>
</tr>
<tr>
<td>MD100</td>
<td>25 - 1&quot;</td>
<td>102</td>
</tr>
<tr>
<td>MD114</td>
<td>32 - 1 1/4&quot;</td>
<td>105</td>
</tr>
<tr>
<td>MD112</td>
<td>40 - 1 1/2&quot;</td>
<td>124</td>
</tr>
<tr>
<td>HD112</td>
<td>40 - 1 3/4&quot;</td>
<td>-</td>
</tr>
<tr>
<td>MD200</td>
<td>50 - 2&quot;</td>
<td>124</td>
</tr>
<tr>
<td>HD200</td>
<td>50 - 2&quot;</td>
<td>-</td>
</tr>
<tr>
<td>MD212</td>
<td>65 - 2 1/2&quot;</td>
<td>162</td>
</tr>
<tr>
<td>HD212</td>
<td>65 - 2 1/2&quot;</td>
<td>-</td>
</tr>
<tr>
<td>MD212E</td>
<td>80 - 3&quot;</td>
<td>-</td>
</tr>
<tr>
<td>HD212E</td>
<td>80 - 3&quot;</td>
<td>-</td>
</tr>
<tr>
<td>MD300</td>
<td>100 - 4&quot;</td>
<td>-</td>
</tr>
<tr>
<td>HD300</td>
<td>100 - 4&quot;</td>
<td>-</td>
</tr>
<tr>
<td>HD400-4</td>
<td>100 - 4&quot;</td>
<td>-</td>
</tr>
<tr>
<td>HD400-6</td>
<td>150 - 6&quot;</td>
<td>-</td>
</tr>
<tr>
<td>DH600</td>
<td>150 - 6&quot;</td>
<td>-</td>
</tr>
<tr>
<td>HD800</td>
<td>200 - 8&quot;</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1: Screwed Ports: Port Threads to AS 1722.1 All port threads female.
E.g. RP 1 1/4" / 32 = 1 1/4" BSP RP (parallel) 32mm DN

Note 2: Flanged Ports: ANSI CL125 to ANSI B16.1 or Table H to AS 2129 e.g. HD200 AS2129 / DN 50/ H

Flanged ports listed are to suit designated standard for Cast Iron Flanges. When Models listed above with CL125 ANSI flanges are made from Ductile Iron, Steel or Stainless Steel, they will have raised face flanges to suit CL150 ANSI B16.42 Standard. Port dimensions above may vary - check with EBSRAY for details. For other flange standards or alternative screwed port standards refer to EBSRAY.
In the Pump Models marked ③ the coupling forms an integral part of the bearing locking mechanism, therefore, dimensions shown are critical for correct operation.

① In some pump models with 90° ports, the Relief Valve adjusting screw end may be below the pump mounting feet. (Dimension U)

② In some models, the underside of the pump Body may project below the pump mounting feet. (Dimension T)

### Dimensions (continued)

| PUMP MODEL  | A   | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   | N   | P   | Q   | R   | S   | T   | U   | KEY  |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| MD340M③    | 82.6| 114 | 20.8| 42.9| 108 | 152 | 38  | 32  | 79.4| 11  | 74  | 47  | 95  | 120 | 16  | 10  | 19.05| -   | -   | Woodruff |
| MD340M③    | 83  | 54  | 102 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| MD100M③    | 102 | 133 | 11  | 33  | 127 | 171 | 35  | 98.4|     | 128 | 65  | 130 | 160 | 13  | 12  | 28.56| -   | -   | 1/4" x 1/4" |
| MD100M③    | 136 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| MD114③     | 127 | 80  | 175 | 215 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| HD112       | 203 | 240 | 20  | 55  | 129 | 171 | 38  | 98.4| 11  | 140 | 74  | 102 | 102 | 17  | 11  | 28.56| -   | -   | 1/4" x 1/4" |
| HD200       | 203 | 240 | 20  | 55  | 219 | 290 | 54  | 152.4| 17  | 110 | 200 | 16  | 38.09| -   | -   | 3/8" x 1/4" |
| HD212       | 203 | 240 | 20  | 55  | 239 | 320 | 63  | 152.4| 17  | 107 | 275 | 13  | 28.56| -   | -   | 3/8" x 1/4" |
| HD212       | 203 | 240 | 20  | 55  | 239 | 320 | 63  | 152.4| 17  | 107 | 275 | 13  | 28.56| -   | -   | 3/8" x 1/4" |
| HD212       | 203 | 240 | 20  | 55  | 239 | 320 | 63  | 152.4| 17  | 107 | 275 | 13  | 28.56| -   | -   | 3/8" x 1/4" |
| HD212       | 203 | 240 | 20  | 55  | 239 | 320 | 63  | 152.4| 17  | 107 | 275 | 13  | 28.56| -   | -   | 3/8" x 1/4" |
| HD300       | 241 | 305 | 26  | 83  | 235 | 350 | 90  | 238 | 27  | 190.5| 130 | 320 | 380 | 22  | 53.97| -   | -   | 1/2" x 3/8" |
| HD400-4     | 148 | 128 | 295 | 350 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 37 |
| HD400-6     | 365 | 450 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 27 |
| HD600       | 50  | 108 | 115 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 18 x 11mm |
| HD600       | 235 | 170 | 405 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 12 |

Refer to EBSRAY or Representative for HD800 dimensions

**NOTE:** All specifications and illustrations are typical only and subject to revision without notice. Certified data available on request.